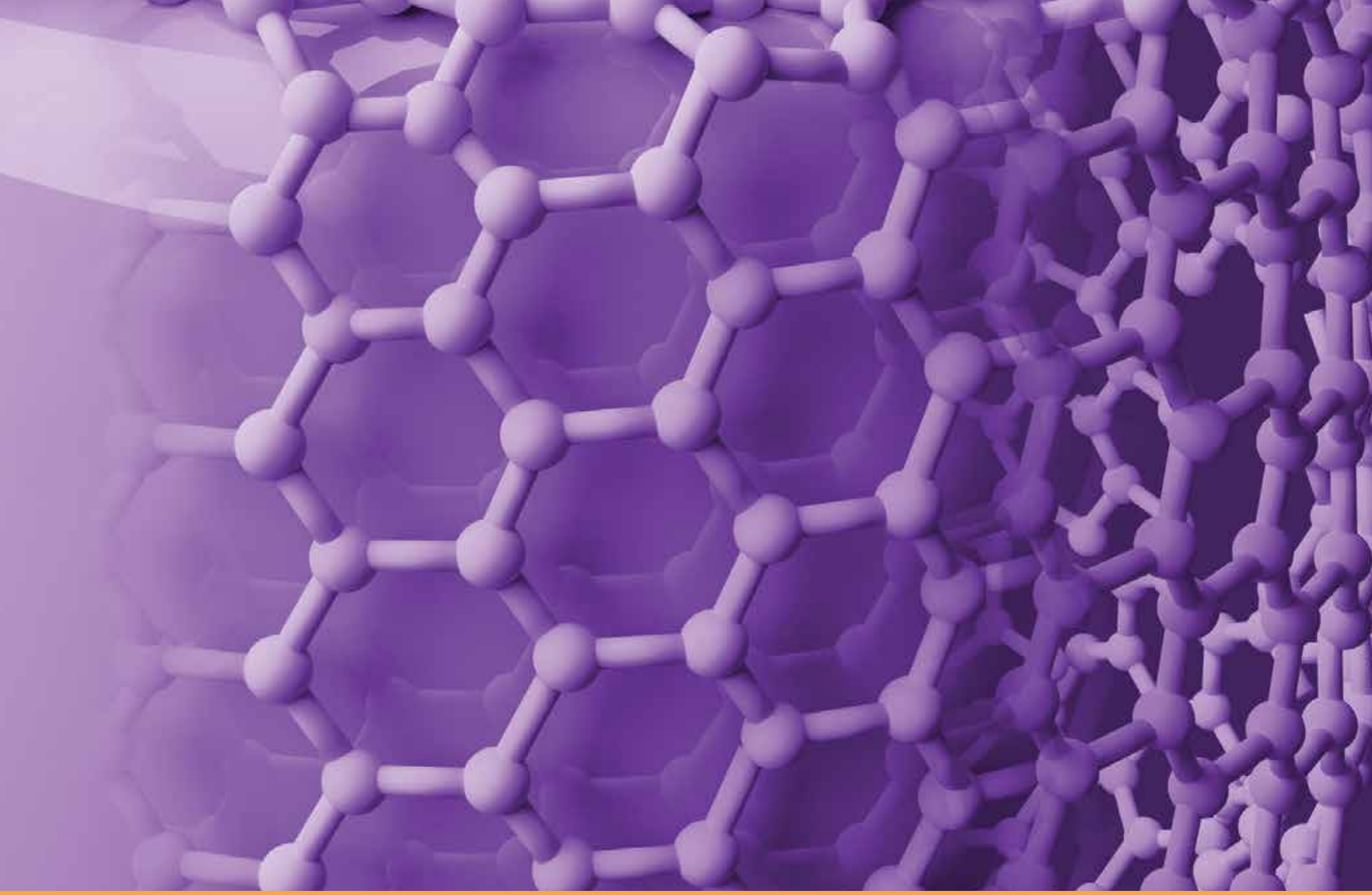

2014 ANNUAL REPORT

IDeA EPSCoR NEBRASKA

EXPERIMENTAL PROGRAM TO
STIMULATE COMPETITIVE RESEARCH

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IDeA EPSCoR NEBRASKA

Experimental Program to Stimulate Competitive Research
Institutional Development Award Program

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(COVER AND ABOVE) *In research funded by a NSF RII Track 1 award, Nebraska scientists collaborated to develop 3D graphene, to improve electronics' efficiency; a model is shown here. Read more on page 7.*

Director's Message

Fertile Ground: Focusing on Plant Systems Science and Engineering

FOR CENTURIES Nebraskans have held handfuls of our state's soil and wondered about the workings of this rich resource from which much of our crops and livelihood grows. Today, with talented researchers and top technology at our universities, Nebraska can do much more to understand how plants function: as systems at the intersection of soil, microbes, water and climate.

Nebraska EPSCoR's role in this challenge is our continuing effort to move this state forward, aligning its unique capabilities to address the foremost issues on our nation's research agenda. For a research component of Nebraska's new RII Track 1 grant sought from the National Science Foundation (NSF), we gathered Nebraska's strengths in agriculture, technology and more in a multi-disciplinary initiative to advance understanding in plant-soil-microbe interactions. The resulting transdisciplinary team, including several strategic new hires, unites many of Nebraska's leading scientists, engineers and specialists with important perspective for plant systems science study.

This work holds great transformative potential, requires a systems science approach, and tracks to high technical and societal impact. The plant-soil interface is an important, yet still largely undescribed, habitat for Earth's organisms. Our Nebraska group aims to develop a systems-level understanding of key microbial taxa and processes involved in plant-soil-microbe interactions—creating a valuable resource for effective land use management and sustainability, enhancing plant diversity, and increasing plant productivity.

Whether NSF funding for this research is realized or not, our state will benefit from this nexus of leaders shaping greater possibilities for life in Nebraska and our wider world. With their tools and expertise, the future of food productivity and environmental stewardship is in capable hands.

— F. Fred Choobineh

State Committee Members Shape EPSCoR Efforts

Nebraska EPSCoR operations follow policies and priorities set by a 19-member, Governor-appointed state committee. This group is comprised of senior administrators and researchers from the state's major research institutions, industry leaders, and representatives of state government. With their guidance, Nebraska EPSCoR works throughout the state to advance transformative research and workforce development.

Departing the state committee in 2014 are **Catherine Lang**, former economic development director and labor commissioner for the state of Nebraska, and **Clague P. Hodgson**, president of Nature Technology Corporation. Nebraska EPSCoR thanks them for their service, and appreciates the time and efforts of the continuing state committee members in shaping how Nebraska EPSCoR pursues opportunities to benefit the state.

(Please view the back cover of this publication for the 2014 list of Nebraska EPSCoR State Committee members.)

This year Nebraska EPSCoR's state committee welcomed three new members:

SUSAN FRITZ, is executive vice president and provost with the University of Nebraska (NU). She was associate vice president for Academic Affairs in the NU Provost's Office, following her work as associate vice chancellor for the Institute of Agriculture and Natural Resources (IANR) and interim dean of the Agricultural Research Division. She also directed IANR's international agricultural programs, and is a former associate dean of the College of Agricultural Sciences and Natural Resources (CASNR) and department head of the Agricultural Leadership, Education and Communications (ALEC) program. She earned bachelor's, master's and doctoral degrees from the University of Nebraska-Lincoln (UNL).

J. TYLER MARTIN, SR., is founder and CEO of Great Plains Biotechnology, located just outside of Lincoln. This firm helps create opportunities on the frontiers of biology by providing strategic advice to companies developing new life science products. He also serves as CEO and director of Adjuvance Technologies, a privately-owned biopharmaceutical company that operates from New York City and Lincoln. He has held leadership positions with Dynavax Technologies, Novartis, and others. His bachelor of science degree in Chemistry is from the University of Nebraska Kearney and his M.D. is from the University of Nebraska Medical Center.

DACIA KRUSE became acting director of Nebraska's Department of Economic Development in June, after serving as deputy director of the state's Department of Administrative Services. She was previously the Greater Omaha Chamber of Commerce's primary lobbyist with state and local officials on business legislation. She also managed successful initiative campaigns in Iowa and Nebraska and was a women's advocate for Friendship Home. Her bachelor of science degree is in Business Administration from UNL.

Exploring the Frontier:

The 2014 Nebraska Neuroscience Symposium

THE 2014 Nebraska Neuroscience Symposium gathered experts from throughout the nation to discuss new research on the brain's functions in learning and its pathologies, including addiction. Approximately 300 Nebraska scientists and students attended the symposium, sponsored by Nebraska EPSCoR through a National Science Foundation (NSF) grant, at the Hilton Omaha. In a concluding session, 50+ posters were presented by researchers from the University of Nebraska Medical Center, University of Nebraska-Lincoln, University of Nebraska at Omaha, Boys Town National Research Hospital, Doane College, Nebraska Wesleyan University and Creighton University.

Thomas F. Murray—Creighton University's (CU) associate vice provost for research and scholarship and professor and chair with CU's Department of Pharmacology—chaired the symposium's organizing committee. Their work drew to the event a stellar slate of speakers from the National Institutes of Health, Duke University and Mount Sinai Hospital, among other prominent organizations.

In the decade that Nebraska EPSCoR has conducted its annual "Nebraska Research and Innovation Conference" (NRIC) series, this second neuroscience-themed conference further solidified Nebraska's research in this vital area of study.

"NRIC events are venues where we can celebrate our research strength, and provide opportunities for researchers to network," said Nebraska EPSCoR Director **Fred Choobineh**. "We value the individual contributors and group efforts in this state's research community, including faculty and especially our students who carry this work forward."

FROM LEFT: More than 50 research posters were presented; participants enjoyed networking opportunities; 11 sessions with international experts on neuroscience earned interest from 300+ event registrants.

Our 2014 NRIC speakers

CLOCKWISE FROM LEFT: PAUL KENNY, Mt. Sinai Hospital; **DARWIN BERG**, University of California San Diego; **JOHN DANI**, University of Pennsylvania; **MARINA PICCIOTTO**, Yale University; **PATRICK KANOLD**, University of Maryland; **TIMOTHY MURPHY**, University of British Columbia; **LING-GANG WU**, NIH; **WILLIAM CATTERALL**, University of Washington; **SARAH LISANBY**, Duke University; **TOM MURRAY**, Creighton University; *Not Pictured*: **ANDREW SCHWARTZ**, University of Pittsburgh; **JOHN FLANAGAN**, Harvard Medical School.

Thank you to the 2014 Symposium Organizing Committee:

- **Thomas F. Murray,** Committee Chair, Creighton University
- **Rick Bevins**, University of Nebraska-Lincoln
- **Anna Dunaevsky**, University of Nebraska Medical Center
- **Jeffrey French**, University of Nebraska at Omaha
- **Barbara J. Morley**, Boys Town National Research Hospital
- **Wallace B. Thoreson**, University of Nebraska Medical Center
- **Tony W. Wilson**, University of Nebraska Medical Center

NSF EPSCoR RII Track 1 Advances

IN YEAR 4 of Nebraska's $20 million NSF EPSCoR Research Infrastructure Improvement (RII) Track 1 award (2010–2015), the project teams continued their research progress to meet high expectations from NSF and the grant's External Review Panel (ERP).

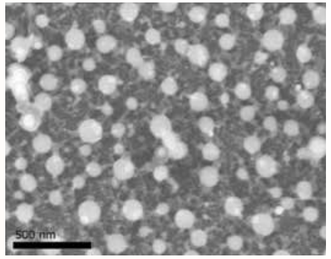
Area 1: Nebraska Center for Nanohybrid Functional Materials (CNFM)

The CNFM team seeks to combine the unique physical properties of highly-ordered 3D-nanomaterials with chemical and biochemical recognition in order to develop new sensing and separation principles which will provide the basis for new and more powerful sensors and separation devices. The team's 2014 research foci included single-strand folding based sensors, complex folding-based sensors, ultrathin-layer birefringence imaging chromatography, substrate-mediated gene delivery and GLAD (glancing angle deposition) surface functionalization.

Rising to the challenge of prior External Review Panel advice, CNFM developed an industrial advisory board to help the center's commercial transitions for the innovations it generates. This board is chaired by **Win Ly** (Biosensing Instruments); members include **Baabi Das** (Zansors Inc.), **Dan Draney** (LICOR Technology), **James Hilfiker** (J. A. Woollam Company), **Mina Hovinen** (Seagate Technology) and **Matthew Wagner** (Procter & Gamble).

Among CNFM's accomplishments in 2014, several of its researchers earned commercial and professional development success:

- CNFM's **Rebecca Lai** (University of Nebraska-Lincoln [UNL] Susan J. Rosowski Associate Professor of Chemistry) is the PI for a $208,092 Small Business Technology Transfer (STTR) grant from the National Institutes of Health, for Disposable Paper-based Electrochemical Metal Ion Sensors for Water Safety Testing. This Phase I application aims at developing a generalizable electrochemical biosensing platform for detection of metal ion contaminants in water—a project involving Zansors Personal Health Analytics.
- **Tino Hofmann** (CNFM; research assistant professor with UNL's Department of Electrical Engineering) was named a Marie Curie Fellow and VINNMER Fellow. The Fellowship is supported by the EU Marie Curie Action and Sweden's innovation agency VINNOVA with a $350,000 grant to establish a tight collaboration between UNL, the University of Linköping, Sweden, and private enterprises in the US and Sweden. The goal of this collaboration is to design, manufacture, and characterize graphene-metal nanostructure hybrid materials for novel terahertz frequency devices.
- **Mathias Schubert**, CNFM co-director and UNL professor of electrical engineering, was named a Fellow of the Leibniz Institute of Polymer Research in Dresden, Germany. And **Petra Uhlmann**, director of the institute's Department of Nanostructured Materials, was named an adjunct professor with UNL's Department of Chemistry. In these roles, they co-supervise graduate students and perform collaborative research. The Leibniz Institute of Polymer Research Dresden is one of the largest polymer research institutions in Germany and engages in application-oriented fundamental research.



Area 1 Research Focus

Team Develops 3D Graphene Nanostructures to Improve Electronics

GRAPHENE IS a two-dimensional carbon material known for its strength and conductive properties. Theoretical studies indicated new physical properties can be achieved if graphene is shaped in forms other than flat sheets.

Recently **Alexander Sinitskii**, assistant professor in the University of Nebraska-Lincoln (UNL) Department of Chemistry, had success in developing narrow nanoribbons of graphene, manipulating the material's promising potential for electronics uses. Sinitskii was hired by UNL in 2011 with the creation of the Center for Nanohybrid Functional Materials (CNFM), as part of a National Science Foundation Research Infrastructure Improvement Track 1 grant (2010-15). Sinitskii and several CNFM members explored growing graphene in new, three-dimensional (3D) structures.

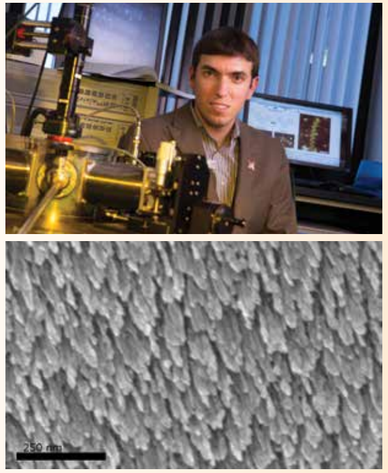
Graphene as a coating alters surfaces to either functionalize (add properties to) or passivate (counteract properties from) the materials beneath. Sinitskii's collaboration with CNFM innovatively applied graphene through chemical vapor deposition (CVD) on pre-synthesized nanostructured metal templates, then etched away the metal substrate to achieve novel 3D graphene structures. The scaffolding metal nanopillars were prepared using glancing angle deposition in the labs of CNFM's **Eva Schubert**, associate professor with UNL's Department of Electrical Engineering; preparing this class of ordered nanostructure has been central to numerous research advances reported by CNFM investigators.

The CNFM team systematically studied combinations and factors to find that—with careful attention to composition, shape and crystallinity of the nanostructured metals, as well as CVD growth temperature and carbon sources—the nanostructured metal bases could be removed leaving free-standing, graphene-based inverse opals and hollow graphene nanopillars.

CNFM's **Tino Hofmann**, research assistant professor with UNL's Department of Electrical Engineering, applies his optical characterization expertise to study applications of 3D graphene in sensing: a major focus among the center's advances. CNFM's **Rebecca Lai**, an electrochemist and UNL's Susan J. Rosowski Associate Professor of Chemistry, integrates 3D graphene in her work on folding based sensors that can directly detect cancer molecules. **Peter Wilson**, a UNL graduate student advised by Sinitskii, was the first author on the research publication titled "Three-dimensional periodic graphene nanostructures" (**http://rsc.li/1ynWpg3**)—one of the most accessed articles in the *Journal of Materials Chemistry C* during 2014.

High electrical and thermal conductivity coupled with high mechanical and chemical stability of these graphene nanostructured hybrids could yield a sensing alternative to gold thin films or serve in lithium ion batteries—with graphene coatings stabilizing the electrode-electrolyte interface.

Working with CNFM researchers, **ALEX SINITSKII** developed 3D graphene.



A scanning electron microscope image shows a cross-section of graphene coating, via chemical vapor deposition, over cobalt as slanted columnar thin film (SCTF). NSF-funded Nebraska research found that etching away the latter material (substrate) yields 3D graphene.

Area 2: Nebraska Coalition for Algal Biology and Biotechnology (NCABB)

THE NCABB team advanced understanding and enhanced development of algae for biofuels in several project initiatives during 2014:

NCABB furthered its pursuit of high throughput screening and characterization of chemical compounds that induce lipid accumulation in microalgae, seeking conditions in which these organisms can grow quickly and produce biomass with minimal inputs. Efforts included mutagenesis screens for high biomass accumulators or high lipid content strains.

The group developed tools for genetic engineering and genome editing (CRISPR/Cas9 system), delving into the algal strain *Chlorella sorokiniana*. In the adjacent Research Focus, read how the NCABB team sequenced the genome and documented changes to the transcriptome—the output of messenger RNA molecules expressed from an organism's genes—in the central metabolism of these organisms grown photoautotrophically or mixotrophically. Team members also applied characterization of virus-host interactions in *Chlorella*.

NCABB studied changes to the transcriptome of *Chlamydomonas*; this research focused on nitrogen deprivation tied to this algae strain's lipid production, and explored the role of a 'prokaryotic-like' acylglycerol-3-phosphate acyltransferase in the process.

Further 2014 achievements for NCABB include:

- NCABB's **Concetta DiRusso**, a University of Nebraska-Lincoln (UNL) biochemistry professor, was named a Jefferson Science Fellow (JSF). For 2014-15 she is working in Washington, D.C., with occasional trips abroad. The JSF program is administered by the National Academies and establishes a new model for engaging American academic science, technology, engineering and medical communities in the formulation and implementation of U.S. foreign policy.
- **Paul Twigg**, biology professor at the University of Nebraska Kearney (UNK), received the 2014 Pratt-Heins Faculty award for research and scholarship in recognition for his work on studying plants and algae for biofuel production. His research was also highlighted in UNK's *New Frontiers* publication.
- **Joseph Msanne**, a postdoctoral researcher at UNL in the labs of Prof. **Heriberto Cerutti** and Prof. **Ed Cahoon**, was recognized by the *Journal of Phytochemistry* because his manuscript—"Metabolic and gene expression changes triggered by nitrogen deprivation in the photoautotrophically grown microalgae *Chlamydomonas reinhardtii* and *Coccomyxa* sp. C-169"—was the top cited article for 2012-2013.

OPPOSITE PAGE: Graduate students gained experience on the NCABB team's work to sequence the genome of *Chlorella sorokiniana.*

NCABB Team Sequences Algal Strain's Genome to Spur Biofuels Development

DRAWING ON the extensive capabilities in the plant-focused Beadle Center at the University of Nebraska-Lincoln (UNL), Nebraska Coalition for Algal Biology and Biotechnology (NCABB) students and faculty conducted an 18-month, all-in effort to comprehensively map the nuances of *Chlorella sorokiniana*, a strain of algae identified by the National Alliance for Advanced Biofuels and Bioproducts as promising for biofuels production.

"This *Chlorella* is very heat tolerant and grows fast, accumulating lipids and starch that are precursors for biofuel production, but otherwise very little was known about it," said team leader **Heriberto Cerutti**, professor in UNL's School of Biological Sciences. "In terms of analyzing its genome, we are the leading group in the nation." NCABB co-leaders are **Edgar Cahoon**, UNL George Holmes Professor of Biochemistry and director of the Center for Plant Science Innovation, and **Karin van Dijk**, UNL associate professor of biochemistry.

With their leadership, the Chlorella Genome Sequencing Project was collaborative from the outset. For the closest-ever look at this chlorella strain, Cerutti and Cahoon's labs analyzed its capacity to use carbon substrates, Professor **Don Weeks**' lab studied its carbon dioxide assimilation, Professor **Concetta DiRusso**'s lab assessed its behavior under different temperature conditions, Assistant Professor **Wayne Riekhof**'s lab examined its reaction to plant growth regulators, and Professor **Paul Black**'s lab explored its response to nutrient stresses such as nitrogen deprivation.

van Dijk said, "This project was a great opportunity for the graduate students, postdoctoral researchers and faculty to work as a team, develop tools to deal with this organism, and design experiments to understand how it functions."

She described the work as a back-and-forth exchange among interdisciplinary teams, and the methods developed include ways to analyze much of the strain's gene expression and to manipulate its genome by transformation.

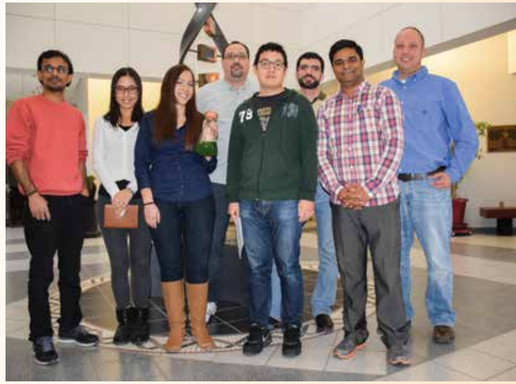
Even above the level of teamwork involved, Cerutti may be most proud of the resulting new computational biology capabilities. He said UNL's Bioinformatics Core Research Facility was especially valuable in developing protocols and algorithms, integrating and improving know-how for further exploration of this algal genome and its functional potential.

Beyond this project, NCABB's work to understand the basic science of algae for biofuels already benefits others in the field.

For example, New Mexico State University (NMSU) operates an EPSCoR-funded outdoor algae cultivation testbed that's had "culture 'crashes' caused by invertebrate grazer populations," said **Pete Lammers**, research professor and technical director of NMSU's Algal Bioenergy Program. "Dr. Cerutti has communicated novel ideas to us about protecting outdoor algae cultures from these decimating grazers."

NCABB aims to publish its algal genome sequencing work in 2015; according to Cahoon, "What we have learned through this project adds value and leads to new opportunities for collaborations and possible grant funding."

NCABB was founded with a portion of Nebraska's $20 million, NSF EPSCoR Track 1 Research Infrastructure Improvement (2010-2015) Award.



NSF EPSCoR RII Track 3

Tribal Colleges Advance Chemistry Offerings

CHEMISTRY IS on a front burner at Nebraska's tribal colleges thanks to a $750,000 RII (Research Infrastructure Improvement) Track 3 grant from the National Science Foundation (NSF). This fall, chemistry classes began with seven students on three campuses: at Little Priest Tribal College (LPTC) and two of Nebraska Indian Community College's (NICC) campuses—Santee and South Sioux City.

The five-year EPSCoR grant's work started in 2013 with planning by **Mark Griep**, associate professor with the University of Nebraska-Lincoln (UNL) Chemistry Department; **Dan Torgerson**, dean of academics with NICC; and **Janyce Woodard**, environmental science instructor with LPTC.

Griep said he values seeing the students gain lab experience to further their career paths and better understand the utility of science in their lives and communities. He added, "The mission of tribal colleges is to provide an education that allows students to self-actualize in ways that help their community."

The curriculum he developed incorporates basic science with topics of community interest and themes. The first few weeks of classes focused on water issues that included data gathering from experiments using spectroscopy; instruction modeled how to prepare a lab report.

Woodard is the course lecturer at LPTC and her sessions are telecast to the other locations. **Bev Devore-Wedding**, a Ph.D. student in UNL's Science Education Research program who taught high school science for the past 20+ years in Colorado, is the lab instructor who drives to the South Sioux City sites.

"Teaching lets me learn all the time, and I'm so glad for this opportunity to participate," said Devore-Wedding, who appreciates helping establish and conduct this program to be sustainable and relevant. "There is a definite need for this curriculum. For careers in STEM (science, technology, engineering and math), chemistry is a huge gateway—particularly for health interests."

After the 2014-15 classes, the planning group will conduct a three-day workshop on science instruction for tribal college representatives, garnering interest from Nebraska, South Dakota and Oklahoma organizations. The summer of 2015 will also be a time for the Nebraska group to refine its classes for Year 3 of the grant; by Year 5, the courses are expected to be self-sustaining with enrollment of six students per term at each location.

Griep explained that the group's work in planning, conducting, sharing and refining is a natural cycle—as depicted in medicine wheel art created by Winnebago artist Laurie Houseman Whitehawk to celebrate the grant's impact in growing STEM resources for Native Americans' education.

(Above) **ROBERT "SCOTTY" CLANCY** and **ROSE BUFFALO CHIEF**, NICC students at the South Sioux City campus, participate in a chemistry lab.

(Opposite page) Medicine wheel art to celebrate the project was created by Winnebago artist **LAURIE HOUSEMAN WHITEHAWK**.

For more information about "Framing the Chemistry Curriculum" see ***bit.ly/1uc1tPP.***

Small College Undergraduate Research Experiences

To help add undergraduate research opportunities at Nebraska's smaller colleges and universities, Nebraska EPSCoR offers funding up to $5,000 per project for collaborations in science, technology, engineering and math (STEM) areas. Faculty and students involved in the selected proposals report their project results to Nebraska EPSCoR, and often present their research in scientific publications and at conferences. The 2014 grant recipients were:

ERIN DOYLE | Biology, Doane College | "Analysis of *P. aeruginosa* Gene Expression Changes for Biofilm Formation"

FRANK FERRARO III | Psychology, Nebraska Wesleyan University | "Psychophysiological Reactions to Natural and Urban Images"

JOHN KYNDT | Science and Technology, Bellevue University | "Cultivation of Algae on Agricultural Waste for Economic Biofuel Production"

HECTOR PALENCIA | Chemistry, University of Nebraska Kearney | "Mechanistic Studies of Novel N-Heterocyclic Carbenes in Biodiesel Synthesis"

LAURA WESSELS | Physics and Physical Sciences, University of Nebraska Kearney | "Single Molecule Study of Fusion Between a Baculovirus Particle and Lipid Bilayer"

ERIN WILSON | Chemistry, Doane College | "Investigations of Molecular Crowding Effects on a Crowding-Sensitive Alpha Helical Peptide and a Minimal Helical Tertiary Fold"

2014 FIRST Awards Announced

Nebraska EPSCoR's FIRST Award provides competitive grants of $20,000 to help advance early-career faculty and their research programs. The expert reviews on FIRST Award finalists' submissions are also valuable as the young faculty refine their work to pursue further development and distinctions, including the National Science Foundation's CAREER Award—NSF's most prestigious award for young faculty. Watch for more achievements to come from the 2014 FIRST Award recipients:

ANDREW BARUTH | Physics, Creighton University | "Directed Self-Assembly of Block Polymer Thin Films for Nanolithographic Applications"

HERNAN GARCIA-RUIZ | Plant Pathology, University of Nebraska–Lincoln (UNL) | "Molecular and Cellular Targets of Antiviral RNA Silencing"

YUEBIN YU | Durham School of Architectural Engineering and Construction, UNL | "A Novel Hybrid Framework on Improving Sensing and Control for Energy Efficient Buildings"

NSF RII Track 2, 2014–17

Imaging and Controlling Ultrafast Dynamics of Atoms, Molecules, and Nanostructures

IN AUGUST, the National Science Foundation (NSF) awarded nearly $6 million to Nebraska and Kansas for collaborative research on ultrafast dynamics of atoms, molecules, and nanostructures. The grant is one of three science and engineering regional consortia to receive funding totaling nearly $18 million for 2014-17 through NSF's Experimental Program to Stimulate Competitive Research (EPSCoR). Other consortia funded in NSF's Aug. 6 announcement were Louisiana-Mississippi and Arkansas-Missouri partnerships.

Nebraska will receive nearly $3 million for its work with the project. **Fred Choobineh**, Nebraska EPSCoR director and University of Nebraska-Lincoln's (UNL) Blackman Distinguished Professor of Engineering, and **Anthony F. Starace**, UNL George Holmes Distinguished Professor with the Department of Physics and Astronomy, lead the Nebraska group's work.

Physicists, chemists, and electrical engineers from UNL, Kansas State University (KSU) and the University of Kansas (KU) now work together to advance the imaging and control of matter interacting with light.

This exciting new research on ultrafast processes in atomic, molecular, and optical (AMO) science and engineering will contribute to technological advances and the development of a diverse STEM (science, technology, engineering and math) workforce, said NSF Program Officer **Timothy VanReken** who oversees the project's progress.

The work in this grant is aimed at solving fundamental research problems whose solutions may lead to important practical applications, said Starace, co-principal investigator with the grant. "For example, the proposed research on atoms and molecules may give researchers the ability to control and image such key molecular reactions as those involved in human vision, photosynthesis, and vitamin D production. The proposed research on controlling electron motion in nanostructures aims at integrating photonics and electronics, thereby allowing researchers to develop the fastest electronic switches to date."

> *"This exciting new research on ultrafast processes in atomic, molecular, and optical (AMO) science and engineering will contribute to technological advances and the development of a diverse STEM workforce."*
>
> *— Timothy VanReken*
> *NSF Program Officer*

The atomic physics groups at UNL and KSU have met informally since the late 1970s for the "Wildcorn" mini-conferences (extending from Friday evenings through Saturday afternoons) at which the groups presented their research to each other, Starace said. At those gatherings, discussions often focused on establishing new research collaborations, and "now this NSF EPSCoR grant finally provides the means to make these long-desired collaborations a reality."

The Kansas and Nebraska groups have complementary experimental and theoretical research strengths, Starace added. By combining these strengths, the prospects for research success are greatly increased.

In addition to the research, the consortium's planned education, outreach, and workforce development activities will involve partnerships with small colleges in Nebraska and Kansas, summer workshops for high school physics teachers, and a variety of programs for students.

"With this federal support, the University of Nebraska will be in a position to do even more to serve the state through education, research and outreach. I'm especially excited about our plans to continue to work with teachers and students around the state to build a strong STEM workforce for Nebraska," said University of Nebraska Interim President **James Linder**. "We look forward to collaborating with our colleagues at the University of Kansas and Kansas State University on this important work."

"These consortia will spur technological innovations that drive economic growth and develop a diverse STEM-enabled workforce," said **Denise Barnes**, head of NSF's EPSCoR program which issues these Research Infrastructure Improvement (RII) Track-2 grants.

(L–R) Kansas EPSCoR's **KRISTIN BOWMAN-JAMES,** Kansas State University's **ITZIK BEN-ITZHAK,** and Nebraska's **ANTHONY STARACE** and **FRED CHOOBINEH** are co-PIs on this grant.

Track 2 Strategic Planning Meeting Focuses Efforts

IN SEPTEMBER, the Nebraska-Kansas Consortium gathered in Lincoln for the group's initial strategic planning meeting. With more than 30 researchers attending, discussion flowed from an overview of the project, led by UNL's Anthony Starace (co-PI), and outlined first-year goals for the two research thrusts as well as the education and workforce development activities.

The first thrust investigates light-driven atomic and molecular processes by a variety of complementary techniques spanning a broad spectral range (including high-order harmonic generation, strong-field ionization processes, x-ray-matter interactions, ultrafast electron diffraction with photoelectrons and laser-accelerated electron sources, and laser-induced electron diffraction). The second thrust extrapolates the basic knowledge of AMO ultrafast science to ordered systems by studying the behavior of light-controlled ultrafast electrons in a wide range of purposefully-designed nanostructures, thereby integrating photonics and electronics.

Together the consortium set goals connected to project timelines and targeted work approaches for best practices.

Project teams from Kansas and Nebraska gathered in September for a planning meeting.

UNO Gains $10.1M NIH Grant for Biomechanics Center

EACH OF us has a vested interest in how our bodies serve our daily activities. When problems arise, our hope is that 'somebody' has found (or is working on) a solution. For many diverse issues related to physical movement, we can look to the world's first Center for Research in Human Movement Variability (CRHMV)—right here in Nebraska.

In August, that center—located at the University of Nebraska at Omaha (UNO)—received the largest research grant in UNO history: a $10.1 million award from the National Institutes of Health (NIH).

This Centers of Biomedical Research Excellence (COBRE) grant is funded by NIH's Institutional Development Award (IDeA) program for states that historically have had low levels of NIH funding; the grant supports basic, clinical and translational research, faculty development, and infrastructure improvements. The award will be distributed over five years, with two opportunities to renew for additional funds.

According to the grant's principal investigator, **Nick Stergiou**—UNO professor and Distinguished Community Research Chair in Biomechanics, and a member of Nebraska EPSCoR's state committee—the grant's projects align young UNO faculty with mentors among University of Nebraska Medical Center (UNMC) researchers and clinicians to address how bodies control and adjust movement patterns and how variability in movement can be tied to, cause or be symptomatic of a number of wide-ranging disorders.

Project leaders with the grant include **Sara Myers** studying levels of variability in peripheral arterial disease (PAD) patients; **Mukul Mukherjee** pursuing how virtual reality can assist mobility in stroke victims; and **Anastasia Kyvelidou** exploring how variations in child posture can help detect early signs of autism.

Stergiou is proud of the talent this work is attracting to and retaining in Nebraska. He cites "a great example of reverse 'brain drain'" in **Jenna Yentes**—a Nebraskan who returned to conduct research on chronic pulmonary obstructive disease (COPD) with the center.

Funding from the grant also allows for the hiring of several new faculty for UNO, the launch of additional pilot research programs, upgrades to equipment, and recruitment of top graduate and undergraduate student candidates to study biomechanics at UNO.

Housed in UNO's $6 million Biomechanics Research Building—a first-of-its-kind, 23,000-sq. ft. research facility that opened in 2013—the center's facilities include a motion analysis lab, acoustics lab, balance and strength lab, virtual reality lab, robotics lab and motor development lab—plus conference space and work stations for undergraduate and graduate students.

Stergiou expresses gratitude for the center's support and achievements to date and excitement that his team's work is "establishing a global reputation as an outstanding research institute in biomechanics."

NICK STERGIOU pauses near motion analysis work in UNO's Biomechanics Research Building.

NIH $11.3M Grant Funds Obesity Research Center at UNL

MANY PEOPLE prefer to ignore the effects of excess fat in the human body, but University of Nebraska-Lincoln (UNL) researchers are taking a closer look at the molecular level of obesity—to help us understand and overcome challenges with this widespread health issue.

A new grant from the National Institutes of Health (NIH) brings $11.3 million to launch the Nebraska Center for the Prevention of Obesity Diseases through Dietary Molecules (NPOD) at UNL. NPOD leader **Janos Zempleni,** UNL Willa Cather Professor of Molecular Nutrition, said the center will have positive impact on multiple levels.

Through NIH's Institutional Development Award (IDeA), this new Center of Biomedical Research Exellence (COBRE) targets five focus areas—for example, with recent attention on types of adipose (fat) tissue, one NPOD team seeks how dietary signals could turn white fat cells into brown fat cells, which burn energy. Zempleni said NPOD's work aims to help combat obesity-related diseases such as non-alcoholic fatty liver disease, cardiovascular disease and Type 2 diabetes.

"Obesity is one of the most important health problems the US faces, and the direct impact of our work from this funding will be to contribute strategies to help address the challenges," said Zempleni. "Another benefit of this grant is workforce development—including training for students and young faculty in project areas.

Zempleni collaborated in two prior Nebraska EPSCoR grants from the National Science Foundation: Nutrigenomics (2002) and Nano-enhanced Epigenetics (2008). From these momentum-building experiences, he helped shape NGN—Nebraska Gateway to Nutrigenomics—bridging disciplines to explore how human genetics may align with certain foods to prevent disease.

NGN was great "food for thought," Zempleni said, and a jumping off point for new areas and partnerships—such as engaging University of Nebraska Medical Center colleagues as mentors for NPOD faculty.

Funding from NIH, the UNL Office of Research & Economic Development and the university's Agricultural Resources Division will help connect work through NPOD's $1 million core facility at UNL East Campus: at approximately $1 million, this 2,000-square-foot area includes lab space, offices and specialized storage.

Another NPOD partner, UNL's Holland Computing Center, will add powerful resources for high—level imaging to depict phenotypes—sets of characteristics generated by the interaction of genes and environment--from the research. The entire project builds on Nebraska's strengths, Zempleni added, for a unique, leadership position in a field where "we can really make a difference" to improve the world's health.

Nebraska Engineering faculty **GEORGE GOGOS**, **SIDY NDAO** and **DENNIS ALEXANDER** collaborate to develop functionalized surfaces to improve spacecraft materials.

NASA Nebraska Space Grant

WHEN NASA seeks to improve its surface materials for spacecraft, tiny properties can have a huge impact—helping a component better endure extreme heat or cold. A $563,131 grant via NASA Nebraska EPSCoR applies skills of University of Nebraska-Lincoln (UNL) researchers to develop functionalized surfaces to improve spacecraft materials.

The team, with faculty from UNL's Electrical Engineering and Mechanical & Materials Engineering (MME) departments, leverages further funds from the university's Office of Research & Economic Development and College of Engineering for a total of nearly $1 million for this project with UNL's Center for Electro-Optics and Functionalized Surfaces.

Center leader **Dennis Alexander**, Kingery Engineering Professor and this grant's co-investigator, adds expertise on ultrafast lasers and femtosecond laser pulses for structuring materials' surface properties at the nanoscale. He collaborates with the grant's PI, MME Professor **George Gogos**, who focuses on flow and heat transfer in functionalized metallic surfaces, and with MME Assistant Professor **Sidy Ndao**, co-investigator, who studies microfluidics in materials.

The project will apply quick-pulse lasers to alter surfaces' microstructures and nanostructures with titanium and silicon carbide, for example, to improve high-efficiency thermal management systems in space. This research, managed by NASA Nebraska EPSCoR as part of the NASA Nebraska Space Consortium, may aid other industries.

Boys Town Earns $11.2M from NIH for Translational, Transformational Research on Hearing

IN MAY, Boys Town National Research Hospital (BTNRH) received an $11.2 million grant from the National Institutes of Health (NIH), to grow Boys Town's Center for Perception and Communication in Children (CPCC). The Center of Biomedical Research Excellence (COBRE) award through the Institutional Development Award (IDeA) program will continue through March 2019 with **Walt Jesteadt**, the hospital's director of research, as principal investigator for the grant.

CPCC research is housed primarily at BTNRH facilities in Omaha and focuses on five projects involving hearing loss and related issues. The projects are:

- The Impact of Mild Hearing Loss on Auditory Perception in Complex Environments
- The Impact of Hearing Loss on Speech Communication by Spanish-English Bilinguals
- Perception and Production of Audiovisual Speech in Children with Hearing Loss—with a close look at mother-child interactions
- Temporal Resolution in Children with Hearing Loss—including study on the fitting of hearing aids
- Gaze Stability in Children with Hearing and Vestibular Loss—investigating the link between inner ear and balance issues

Traditionally not much funding has been directed to these topics, said Jesteadt, although children with even moderate hearing loss are ten times more likely to fail a grade in school. He added, "This center grant provides pooled resources that are really valuable to take our work on these projects to a new level."

Boys Town has international prominence as a leader in clinical and research programs focusing on childhood deafness and related communication disorders, and Jesteadt said this COBRE funding helps BTNRH's young faculty connect with senior faculty mentors in these areas, as well as a select slate of outside experts.

"The Core Facility we're building with this COBRE grant's funding will allow us to integrate auditory and visual stimuli and simulate real world environments to study these issues," Jesteadt said. Construction of an 890-square-foot lab is scheduled to be completed in mid-2015; its 360-square-foot sound attenuating room, the size of a small classroom, will be the largest of BTNRH's hearing labs and will weigh nine tons. The space will be equipped to create virtual environments with 360-degree video and sound—to simulate noisy or quieter classroom settings through synchronized audio and video, and architecturally-planned software for room modeling. Faculty of the University of Nebraska-Lincoln (UNL) College of Engineering's Architectural Engineering program will add acoustics expertise for the CPCC.

Jesteadt said his CPCC team of 34 employees, including 12 members of the BTNRH research faculty, is excited about the potential of translational and transformational impact with further development of their research. "The NIH COBRE program is a good mechanism for building infrastructure," he added, "and its funding will help us expand our work with a path to doing this for the longer term."

NSF EPSCoR Co-funding in 2014

- CAREER: *Adipocytic Mechanotransduction for Obesity*, PI: **Jung Yul Lim**, University of Nebraska-Lincoln, College of Engineering. **$430,554**
- EAPSI: *Investigating the role of soil hydrophobicity on groundwater recharge beneath differing land uses in China's Loess Plateau*, PI: **Zablon Adane**, University of Nebraska-Lincoln, Earth and Atmospheric Sciences. **$5,070** **East Asia and Pacific Summer Institutes for U.S. Graduate Students*
- *Role Of A Lys63 -Specific E2 Ubiquitin -Conjugating Enzyme/Variant In Plant Innate Immunity*, PI: **Lirong Zeng**, University of Nebraska-Lincoln, Plant Pathology. **$247,719**
- *Spatial Population Dynamics in Streams or Rivers*, PI: **Yu Jin**, University of Nebraska-Lincoln, Department of Mathematics. **$163,580**

Young Nebraska Scientists

Algae Camps Bloom with Elder, Student Teachers

NEBRASKA EPSCOR'S Young Nebraska Scientists (YNS) camps enhance the STEM (science, technology, engineering and mathematics) pipeline for students in grades 6-12, while giving graduate and undergraduate students opportunities to gain teaching expertise, and connecting middle and high school teachers. As part Nebraska's National Science Foundation (NSF) RII (Research Infrastructure Improvement) Track 1 grant, **Brad Elder**—chair of and associate professor with Doane College's Department of Biology—has led algal biology and biofuels themed YNS camps.

In his camps, middle and high school students are immersed in the study of algae and its potential as a biofuel—during lab hours and amid local ponds and streams. At the surface, the content may not have much teen appeal, but the way Elder and his camp instructors teach science earns consistently high ratings from participants. Here's a peek at how Elder and his team grow excitement for STEM learning:

Your YNS algal biofuels camps at Doane have been highly rated and praised by student participants. What do you think makes your camps such a success?

- A key step is that the students do real science. When you tell a student of any age "you are going to run an experiment that has never been conducted before and your results could change lives around the world," you get their attention. And more importantly, you get their buy-in to the project and question at hand. They are no longer just counting cells because someone said "count the cells." They are "determining the effectiveness of a novel flocculant" and counting cells is how you answer that question. Students absolutely understand this difference at any age.

In the camps, what has surprised you and how did you adapt the curriculum? How do you contrast the college and camp students?

- Our first challenge was to understand what camp students did and didn't know. For instance, I can tell most college students to weigh an object, and I would never consider that I have to tell them how to operate a scale. For middle school students, we had to step back, readjust and explain just about everything.

  Our next challenge was to plan for the time it takes to get anything done. The first year of our camps we had 20+ students. Trying to get 20 middle school students to safely remove

Continued on page 18 ...

BRAD ELDER (with beard) leads a YNS evening field trip to Spring Creek Prairie Audubon Center in Denton, Neb. The group conducted a "Volta experiment," gathering bacteria-generated methane which accumulates in the pond and is safely set aflame to the campers' amazement.

... continued from page 17

20 microscopes and 20 light sources from a shelf to get them set up and working takes a lot more than the five minutes originally allotted.

To overcome both of these challenges, we simply needed to plan more time for activities, and that includes making sure my (Doane student) instructors also clearly understand the challenge and that we are going to spend time repeating ourselves on a lot of tasks.

Can you give an example of another challenge you faced with the camps?

- One of the other problems that we encountered was simply keeping the students engaged. Counting cells can become boring and certainly listening to lectures can get old. To overcome this, we juggle a lot of our more boring (but necessary) tasks with ones that would get the students up and moving.

  We kept several "get up and moving" activities in our pocket, so we could use them if we thought we needed to wake the class up. For instance, we would take the students around to the other research labs in the building and have the undergraduate college students in those labs explain their research. We could hit one lab for five to 10 minutes and then go back to our own research. This had two benefits: the first was simply getting the students up and moving around; but I think more viably, and the reason we started it in the first place, it was getting the students to see young people doing really cool, amazing research. For our high school students, the difference in age may have only been one year.

What have you heard from the campers that made you feel good about your contribution with the project?

- We get a lot of thank yous and "this was great" (from the campers) but I understand that our camp might be their first science camp. Having said that, if we feel they're unhappy we start looking at ways to improve the experience.

  A couple of things have stood out however. The teachers from the public schools who have attended the camps have often commented about how great our camp is compared to some of the other camps they have experienced. The other fun aspect of what we've been doing is the online algal science videos we have produced. When we first started, I would've bet money that two years later our videos would earn 10 hits. Now they've had more than 60,000, and I get emails about them from high school and college students, as well as high school teachers and college professors, which is a lot of fun.

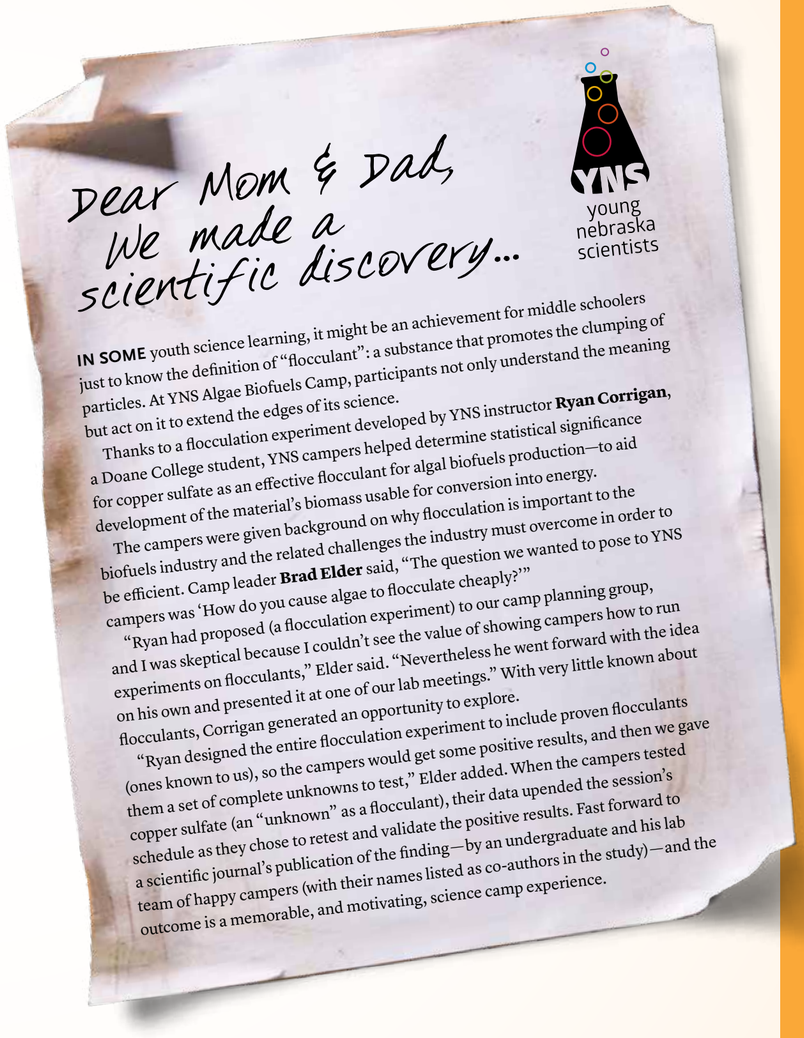
Describe how Doane students helped with the camp material?

- No one involved in the camps—from me to my students—knew anything about algae initially. My background is fire ecology, and I was asked to be part of this EPSCoR project because of my teaching abilities. So when we started planning what we would offer, we spent a whole year just looking at what we could do with the students—because genetically modifying algae to produce more lipids (the focus of this grant) simply can't be done in five days. So the students and I started producing a list of all the possible experiments and projects we could do. Fortunately, so little is available about algae that almost every project we proposed was untested at any level in science.

  Each college student on the project has to design their own labs and teach those units. Their experience of teaching these lessons in the classroom, and using inquiry methods, makes a big difference in these young teachers' abilities and comfort level. They must show their students that this is how science goes—it's entirely possible that all their students' experiments will get negative results—but, like sports, setbacks are normal yet nothing compared to the successes.

By teaching future teachers, you're growing the STEM pipeline—why is that important to you and to Nebraska?

- It's great that our student teachers often plan to stay in Nebraska and teach science. Training STEM faculty to teach using methods that are proven to engage students, foster learning and promote a lifelong interest in learning is an amazing opportunity.



YNS Student Teachers Form the Future of STEM

JAKE KMENT, Doane College senior, science education major, from Fremont, NE

BECCA VOSSLER, Doane College junior, science education major w/biology minor from Milligan, NE

What did you enjoy most about working with Dr. Elder?

JK: It has really helped me prepare for my future career. Dr. Elder is a great teacher and getting tips about teaching from him is very useful. Working with him has been better than any other teaching experience I've had.

How has your focus on biofuels shaped your approach as a prospective science teacher?

JK: Algal biofuels is a topic that I now know a lot about and can bring into my future classroom. I hope to incorporate some of the modules from camp into my curriculum and use some cool lab instruments that students typically wouldn't access.

BV: I would absolutely love to teach an environmental science class and be able to adapt the lessons we've made into part of that class. It's such an important, interesting topic that raises students' interests.

What have you heard from the students that made you feel good about your contribution w/the project?

BV: From what I heard from students, they were having a blast at our camp. The students got so excited that they would be sampling and collecting their own data. One of their favorite lessons was when we let them choose what they were going to use for their experiment. They loved that they got to make their own decisions of how they wanted the experiment to run. Many of our students asked us if they could take their algae home so they could grow their own cultures and run their own experiments. The students made several comments about how cool it was to work on something that could change everything within biofuels.

STEM To Go:

Decade of Mobile Labs Engages High School Students

CLIFFORD STAINS, assistant professor with the University of Nebraska-Lincoln (UNL) Department of Chemistry, knows well how high school experiences can spark interest in STEM (science, technology, enginering and mathematics) pursuits.

"I was a beneficiary of a set of NSF-funded mobile science labs at my high school in rural central Pennsylvania," Stains said. "As a first generation college student, these labs made a big impact on my career choice (and) I would like to bring the same passion for STEM to disadvantaged students in Nebraska."

Stains has partnered with Nebraska EPSCoR to add his time and talent to help grow further

In the long term, we envision using the labs to enrich STEM education in rural, low-income Nebraska communities.

– Cliff Stains, UNL Chemistry

experiences for students in similar settings. Nebraska EPSCoR has been delivering free mobile science labs to high schools in Nebraska for the past 10 years through the **Molecular Biology for Secondary Classrooms (MBSC)** program. Stains is the first faculty to utilize the MBSC program to train new teachers and expand participation.

MBSC provides equipment, materials, and instructional support for three labs adapted from Bio-Rad's Biotechnology Explorer™ program: a bacterial transformation lab, a restriction enzyme digest of Lambda DNA lab, and a polymerase chain reaction (PCR) lab.

According to **Sarah Zulkoski**—Nebraska EPSCoR outreach coordinator—by lending these labs to more than 30 Nebraska secondary teachers, MBSC reaches nearly 1,000 ethnically, geographically, and socio-economically diverse Nebraska secondary students each year.

Stains is adding to the program by offering summer workshops for high school teachers at educational service unit (ESU) sites across Nebraska, helping teachers become familiar with the scientific concepts contained in the mobile labs and prepare lesson plans for using them in their classrooms. Those teachers become part of the MBSC network served by Nebraska EPSCoR. Stains notes teachers' feedback about these workshops has been unanimously positive, and adds that ESUs and teachers seek more offerings of these on-site workshops.

O'Neill High School science teacher **Bryan Corkle** has used MBSC materials in his teaching since 2006. He said the extra learning opportunities for his students "would not have been possible without this program," and added that several former students have reported from their first biology courses in college that they were "better able to know what's going on in class, thanks to their mobile labs experiences" with Corkle.

(TOP) **BRYAN CORKLE**, **SARAH ZULKOSKI** and **CLIFF STAINS** spoke about MBSC to teachers at the 2014 Nebraska Summit on Math and Science Education.

(BOTTOM) **CLIFF STAINS** works with Upward Bound students using MBSC resources.

STEM On Board

Equipment in one of the four available MBSC kits—traveling across Nebraska for two weeks of use by high school classes—includes:

- A classroom set of adjustable micropipettors and gel electrophoresis equipment
- A 96-well PCR thermal cycler
- Mini-centrifuges, vortexers, a mini-incubator and a hot water bath

Each loaned lab set includes $10,000 in equipment for secondary teachers and students—an investment that pays off each time an MBSC experience inspires new interest in science.

Young Nebraska Scientists' High School Researcher Program

FORMER YOUNG Nebraska Scientists' (YNS) summer research student **Lesly Garcia**—below, in lab coat—is a University of Nebraska-Lincoln (UNL) biology student working in the Beadle Center lab of **Audrey Atkin**, associate professor with UNL's School of Biological Sciences. Garcia is involved in testing whether a protein is made in a cell and where it is located within the cell.

Atkin's National Science Foundation-funded project aims to help better understand basic ways genes are regulated and this new understanding has the potential to address genetic diseases such as muscular dystrophy. Garcia said her two summer experiences with YNS give her an advantage in biology classes: "When my professors ask students questions, I'm the first one with my hand up (to answer)." Atkin praises the high school student researchers she's hosted as bright, enthusiastic and open to learning. "It's important for them to see people they can relate to working in science," Atkin said. "Especially when they can see that there are different paths to success."

Garcia's older sister, Jackie, was a YNS summer researcher in high school; she now majors in Biochemistry at UNL and works in the lab of **Wayne Riekhof**, assistant professor in the School of Biological Sciences.

LESLY GARCIA and **AUDREY ATKIN** work in UNL's Beadle Center.

Nano Rises with Burks' Talk at WoPhyS14

THEY CAME from the University of Puerto Rico, Bryn Mawr College and the University of California-Berkeley—among a diverse range of programs. Nearly 100 undergraduate women and men gathered at the University of Nebraska-Lincoln (UNL) in November for WoPhyS14, the annual Women in Physical Sciences conference for outstanding student researchers. WoPhyS participants present their research, network with students from other universities, and attend talks by leading scientists.

Funded largely by Nebraska EPSCoR, the event is organized by the Materials Research Science and Engineering Center (MRSEC) and other UNL partners. WoPhyS covers all participants' local expenses—including registration, food and hotel accommodation.

Themed "Nano Rising," this year's three-day event spanned varied areas of science, technology, engineering and math (STEM), with plenary speakers from NASA and the SLAC National Accelerator Laboratory. Participants toured UNL's DIOCLES Laser Lab, the Nebraska Center for Materials and Nanoscience (NCMN), and electrical engineering facilities, plus enjoyed a barbecue dinner and live jazz in UNL's new physics building, Jorgensen Hall.

Setting the tone early in WoPhyS14 was the "Bench & Beyond" talk by **Raychelle Burks**—a postdoctoral research associate in the Doane College lab of **Andrea Holmes**, part of the Center for Nanohybrid Functional Materials with National Science Foundation funding through an RII Track 1 grant via Nebraska EPSCoR. Burks, who hosts several American Chemical Society videos, said:

"I am a forensic scientist, specifically an analytical chemist—so I find a specific needle in a stack of needles. I like the challenge of saying 'tell me what you are looking for' and 'here's how I can help.' That's when I get to be MacGyver and Sherlock Holmes, rolled into one.

"With the Holmes team that's developing deTECHip® (a molecular sensing array), I design assays to detect all kinds of situations, such as formaldehyde in gas form. We're currently looking at how to provide this product in app form for smartphones.

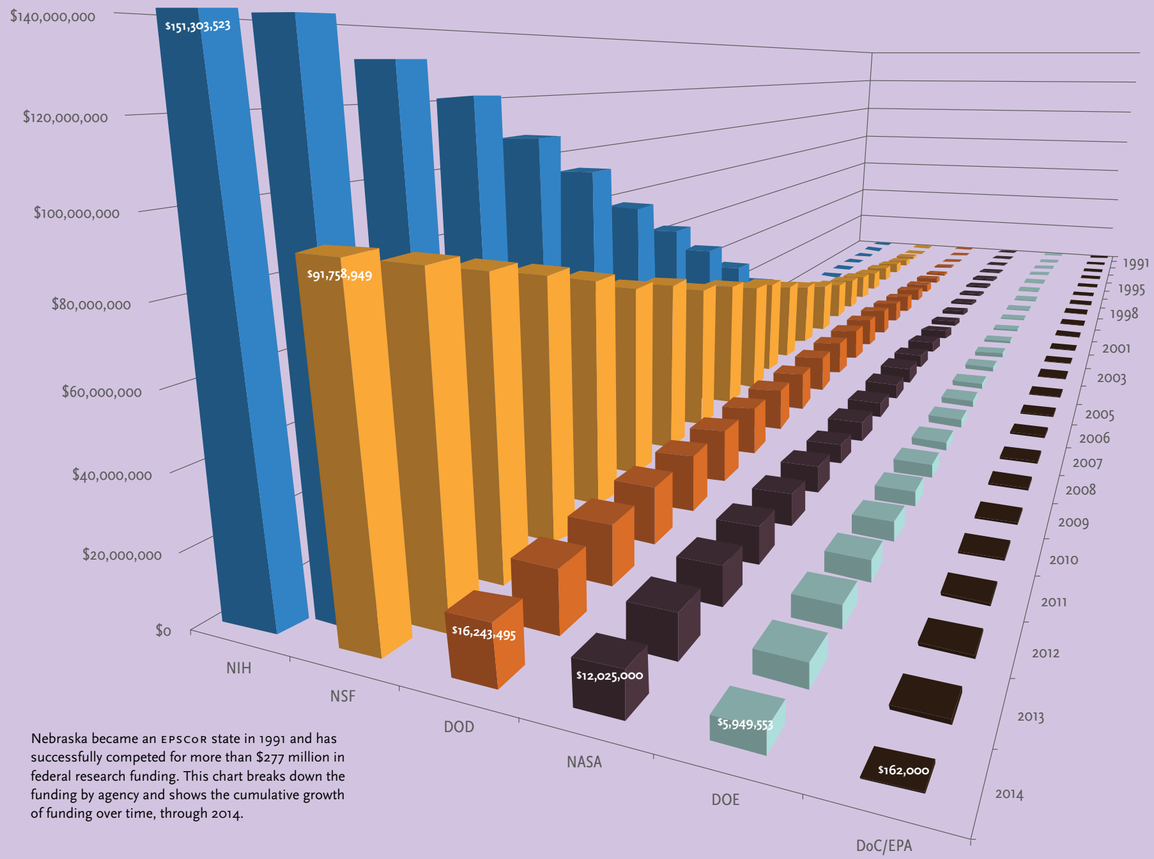
"Here's my advice: each day write your career goal and six ways you are going to approach it. And in the long term, think about communication and outreach for your science. Funding comes from national agencies, industry, etc.—those taxpayers and business leaders are probably not experts in your area, so you need to help them know what you're doing is worth their support.

"Not everybody can be a scientist but I believe everybody should be science-literate, and pop culture is a way that science can 'get in the door' with people. As a scientist, being an ambassador for science is part of my professional life. I organized SciPopTalks (a speaker series with UNL Libraries), and we just got grant funding to make videos to share our upcoming sessions, which include the science in Marvel comics."

Burks answered audience questions about life as a post-doc and concluded with inspiration for STEM careers. She quoted **Fabiola Gianotti**, director-general with CERN in Switzerland, who described her organization's work as "not only a great scientific endeavor, but a unique human adventure."

RAYCHELLE BURKS, a post-doc with Nebraska's NSF-funded Center for Nanohybrid Functional Materials, shares wisdom at WoPhyS2014.

Total Federal EPSCoR Funding in Nebraska



Nebraska became an EPSCoR state in 1991 and has successfully competed for more than $277 million in federal research funding. This chart breaks down the funding by agency and shows the cumulative growth of funding over time, through 2014.

EPSCoR
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Please see page 3 for members joining and departing the Nebraska EPSCoR State Committee in 2014.

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