

Preview of Award 1301346 - Annual Project Report

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Cover

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PD/PI Name:

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University of New Mexico

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Submitting Official (if other than PD/PI):

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- Co-Principal Investigator

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Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)

Mary Jo Daniel

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Accomplishments

*** What are the major goals of the project?**

The overarching goal of *Energize New Mexico* is to position New Mexico as a national leader in harnessing and promoting sustainable energy resources, cultivating a well-qualified STEM workforce, and developing a sustainable culture of innovation and entrepreneurship. The project **mission** is two-fold: (1) develop the research infrastructure that will enable New Mexico to address fundamental basic and applied research questions related to improving energy extraction efficiencies and promoting sustainable resource development; and (2) develop the human resources necessary to improve the state's research competitiveness in sustainable energy development, STEM education, and workforce and economic development capacity.

The project is organized into thirteen components, each of which is associated with a strategic priority and specific objectives. Below is listed the **Year 2 focus** for each component based on the *Energize New Mexico* Strategic Plan which serves as a guide and organizing structure for this complex project.

1. **Biological Energy**: Continue optimizing biological productivity, improving cultivation practices, and enhancing energy return on investment and wastewater utilization. This includes assessing productivity of strains cultivated in the outdoor system and photosynthetic function in different environments. Continue the fabrication of equipment for additional outdoor cultivation and provide training in the use of equipment and focus on process engineering to improve cultivation practices. Develop and strengthen collaborations with municipalities, industry and other institutions to support this work.
2. **Solar Energy**: Exploration of dye photosensitizers for nanoparticle ZnS to catalyze reduction of CO₂ and continued work to develop stable bulk heterojunctions from a single polymer system. Increase the involvement of faculty and students from NMSU.
3. **Osmotic Power**: Assess the design requirements of membranes and membrane modules. Using equipment purchased in Year 1, produce hollow fiber membranes for characterization and PRO testing. Incorporate a hired post doc into the team to guide the research and provide mentoring to the cadre of undergraduate students contributing to the research and strengthen connections between institutions.
4. **Uranium Transport and Site Remediation**: Provide additional training and analysis of samples using the ICP-MS purchased in Year 1 and continue measurement of U speciation. Carry out additional characterization of study site(s) for groundwater contamination and select sites and begin investigation of Aeolian transfer of U contamination.
5. **Geothermal Energy**: Train team members in the magneto-telluric (MT) system and other equipment purchased in Year 1 and begin measurements of MT signature and resistivity of identified sites. Characterize the waters and gases in the selected systems, measure the systems' temperatures, and assess the influence of geothermal systems on potable water quality. Use radiometric and cosmogenic dates of fault systems to evaluate the longevity of geothermal systems and begin development of 2D and 3D hydrothermal computer models.
6. **Social and Natural Sciences Nexus**: Continue to build a systems dynamics (SD) infrastructure as well as a statewide water budget and a database of relevant data sources. Begin discussions with the other NM EPSCoR teams to integrate their research into the database and the integrated decision support system.
7. **Diversity**: Develop a Diversity Strategic Plan as a mechanism for enhancing opportunities to meet diversity goals and track progress toward goals. Continue to develop relationships with other diversity-focused programs and organizations in New Mexico and monitor outcomes and impacts of Diversity

Innovation Working Groups.

8. Workforce Development: Continue programs implemented in Year 1: Growing Up Thinking Computationally (GUTC) and the Faculty Leadership and Professional Development Institute (FLPDI). Fully implement the STEM Advancement Program (STEMAP) summer research and academic year component, the first Post-Doc Leadership Workshop and the Creative Startup program (part of the Institute for Creative and Cultural Entrepreneurship). Complete planning and begin recruitment for the graduate student externships that will begin in Year 3.
9. Cyberinfrastructure: Continue to develop and enhance the integrated data storage and modeling portal, connecting with the research teams to support their work. Finalize an "online lab notebook" system that will enable teams to share work efficiently and create an online data documentation form. Provide training for students and faculty in use of CI resources.
10. External Engagement: The Informal Science Education Network (ISE Net) continues to build members' knowledge and use of informal science research and develop programs to communicate EPSCoR research. Employ usage analytics to review and update the program website. Generate an annual report for public audiences.
11. Evaluation and Assessment: Host an External Advisory Committee (EAC) review, gather data on project activities through surveys, and review recommendations from EAC and external evaluator. Conduct a front-end evaluation to inform the museum exhibitions.
12. Sustainability: Complete new faculty hires and conduct teacher professional development workshops facilitated by the NM ISE Net members. Solicit and fund three Interdisciplinary Innovation Working Groups (I-IWGs) and solicit proposals for additional Infrastructure Seed awards.
13. Management: Management Team meets quarterly and reviews progress on Strategic Plan objectives and budgets; component teams meet monthly. Participate in the NSF Reverse Site Visit, conduct two State Committee meetings, and present to the Council of University Presidents. Leadership team makes quarterly campus visits.

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

In this section we describe the progress of the research and CI components. In parentheses after each component name, we provide the percent of Year 2 activities in the Strategic Plan that will be complete by the end of Year 2.

Bioalgal Energy(100%): The Bioalgal team progressed on all research activities related to optimizing biological productivity (outdoor algal systems, micro-photobioreactors, and algal community ecology), improving algae cultivation practices, and enhancing energy returns and wastewater utilization. We conducted biomass productivity tests for *Galdieria sulphuraria* and for *Chlorella sorokiniana* and tested two cultivation-mixing systems. We investigated the effects of hydrothermal liquefaction (HTL) process conditions on oil yield, energy recovery, water phase composition, and bio-char quality and performed a life cycle analysis of the biodiesel production from algae. Additional baseline data on the turf scrubber system was collected and refinements to

the system were implemented. We also investigated the use of giant quantum dots to convert non-usable to usable forms of light within gel beads and conducted a temperature and cell density experiment using the Photon Systems Instruments (PSI) photobioreactors that UNM proposes to purchase.

Solar Energy (85%): We purchased key spectroscopic instrumentation that will enable us to: (1) explore the potential of solar energy in reducing atmospheric CO₂ toward solar fuels such as methanol, an alternative transportable fuel; and (2) design more efficient organic solar photovoltaic cells. We have extended our research collaboratory by inclusion of a new team member from NMSU. Additional spectroscopic laboratory equipment (lasers, detectors, etc.) have been purchased for our proposed magneto-photoluminescence experiments. NMT used NM EPSCoR faculty start-up funds to hire an ultrafast spectroscopist who will be mentored by a newly hired, accomplished ultrafast spectroscopist at UNM, further strengthening the inter-institutional collaborations and enhancing our capacity to employ time-resolved spectroscopy to achieve research goals. We explored new photosensitizers such as phthalocyanines and porphyrins in conjunction with reduced Graphene Oxide and solar simulated conditions with micron size MoS. We continue to discuss and develop methods for synthesis of new polymeric systems and characterization.

Osmotic (100%): The Osmotic Power Development (OPD) team is on schedule to complete the design/construction of the power generation subsystem (Pressure-Retarded Osmosis or PRO), the HFM fabrication subsystem (Fiber Spinning, Fiber Dope Preparation, and Potting), and the HFM characterization subsystem (Water Permeability Measurement, S-factor Evaluation, and OD/ID Measurement) of the proposed bench-scale osmotic power system. This system is required to achieve the component's Strategic Priority of developing osmotic power using oil-field highly saline produced waters. We assessed the design requirements of membranes and membrane modules, the key component of the system, based on the literature and initial laboratory findings and developed technical performance metrics and the associated benchmarks to facilitate the assessment. This task is an iterative process with earlier results driving modifications of the systems. The team studied the effects of various parameters on membrane properties (e.g., salt rejection and water flux). The team will continue the effort to optimize the membrane fabrication process and selected designs will be prototyped using a custom-made 3-D printer (under construction by the team) for proof of concept.

Uranium Transport and Site Remediation (100%): We are conducting research at locations in the Navajo nation and Laguna Pueblo to improve our understanding of uranium biogeochemistry and occurrence. Batch experiments, sequential extractions, advance microscopy, spectroscopy and aqueous chemical analyses have been employed to characterize sediments from both locations and begin to understand the fate and transport of uranium. Dust traps for wind transport study have been installed at Laguna Pueblo; samples were collected for the column study and are being analyzed. Soil samples were also collected at these sites and are being prepared for metagenomic analysis. Soil, rock and water samples were collected from a uranium mine site at Ambrosia Lake; these soil samples are being used in the column studies and in the microbial study. We will conduct a spring sampling campaign at San Mateo Creek site to assess the occurrence of contaminant plumes and perform field-scale mapping and modeling. New inorganic-organic hybrid material for uranium filtration has been developed and collaboration with the Osmotic Power team has begun.

Geothermal (100%): We began an effort to locate blind geothermal systems using geochemical geothermometers combined with solute transport theory and assembled a statewide geochemical data base. We focused on two trace elements (lithium and boron) that are often found in high concentrations within geothermal systems. Team members received training on our Zonge MT/TEM/AMT system and we located a test site for the MT system just south of Socorro that a local geophysical consultant is using to test his EM geophysical systems. We created and are delivering an innovative inter-institutional graduate level course "Geothermal Energy: Tectonic Setting, Exploration, Production, Sustainability" which provides a unique opportunity to combine research with education as students are actively engaged in our component's research activities.

Social & Natural Science Nexus (88%): The major activities continue to be the collection of data for various components of the Systems Dynamic (SD) model; the development of components; the development of an SD frame that will connect the dynamic water budget with the energy, socioeconomic and environmental components; and the development of the statewide survey. The statewide, dynamic water budget is well underway. The structure of the model has been developed and the spatial and temporal resolution chosen. Data has been gathered and transformed to be compatible with the modeling effort and numerical models and existing algorithms have been developed for incorporation into the dynamic model. We've developed the basic frame for fossil fuel energy production and a preliminary SD model for the San Juan Basin. Ongoing work will develop statistical and econometric relationships between economic conditions and energy production. The draft statewide perceptions survey has been developed and revised several times based on discussions with energy experts in the state and a literature review of related work. Upon completion, it will be tested with focus groups and individual interviews. We are in the process of submitting interview and survey materials to the UNM Institutional Review Board (IRB).

Cyberinfrastructure (CI) (85%): The new data portal interface developed during Year 2 provides a streamlined interface for discovering and accessing data products and services for datasets and educational materials integrated into the data portal. Data management, analysis and visualization tool descriptions were integrated into a searchable database available through the NM EPSCoR website. A DataONE Tier 1 member node went into production in June 2014 and a Tier 4 member node is scheduled for May 2015. OwnCloud was selected as the project's online notebook and data collaboration system; 39 user accounts were created. Enhanced OwnCloud capabilities will be employed and training provided in spring 2015. An online data documentation form will be fully tested and implemented by April 2015; this will facilitate ingest of components' research data into the NM EPSCoR data repository. The developed repository API will accelerate integration of EPSCoR data products into the DataONE network, catalog.data.gov, and UNM's LoboVault.

Specific Objectives:

Diversity (100%): Three Diversity Innovation Working Groups (D-IWG) were held at the end of Year 1, accelerating the original timeline. Proposals for additional D-IWGs will be solicited at the end of Year 2. Impacts of the Year 1 D-IWGs are described in a later section of this report. The Diversity team completed a Diversity Strategic Plan and have used it to direct and coordinate activities towards meeting our diversity goal of 50% URM and women in all project activities. We achieved that goal for all groups except faculty. Our state-wide "All Hands" meeting included a session that actively engaged all project personnel in interdisciplinary, structured, small-group discussions of diversity issues and solutions. Our collaboration with the NM AMP program

expanded; our Diversity Coordinator participated in their annual conference and they co-sponsored the NM Academy of Science Research Symposium with us. Our Diversity Coordinator attended the national SACNAS conference with 3 STEMAP students and initiated a multi-jurisdictional booth for NSF EPSCoR programs. Our Diversity Coordinator has also initiated a project, in partnership with the American Indian Science and Engineering Society (AISES), to create and distribute images and videos of Native American STEM professionals to K-20 classrooms and communities throughout Indian Country. By the end of Year 2, the "Natives in STEM" team will create image mockups for feedback from focus groups, brainstorm and contact STEM professionals to set up film and photography meetings, and seek sponsorship.

Evaluation and Assessment (100%): Our external evaluator, Minnick and Associates completed his Year 1 External Evaluation report (attached), which the Management Team reviewed and has used in its discussions of program progress. Minnick also attended several of the workshops and meetings in Year 2 and provided individual activity evaluation reports, which are being used to review and, as appropriate, revise those activities. The External Advisory Board met at the end of Year 1, in conjunction with the statewide meeting. The management team reviewed their report and prepared a response (attached) and has worked to implement their recommendations as described in a later section of this report. Elsa Bailey Consulting implemented a "front –end" evaluation that gathered data about public perceptions and interests in energy-related topics that will be used to inform the museum exhibitions planned for years 3-5 of the project. The results of this evaluation will be shared with members of the Informal Science Education Network (ISE Net) in March 2015.

Sustainability (90%): NM Tech completed its faculty hire, stretching the EPSCoR start-up funds to assist with two faculty hires. NMSU is in the faculty search process and expects to hire a new faculty member for the Social and Natural Sciences Nexus component by July 2015. The Informal Science Education Network held a *Reflecting on Practice* workshop for museum educators in January 2015. Five NM ISE Net institutions--Explora, NM Museum of Natural History and Science (NMMNHS), National Museum of Nuclear Science and History (NMNSH), NM Public Education Department (NMPED) and NM EPSCoR--collaborated to develop and present the Energize NM Teacher Institute in Albuquerque in Summer 2014. Twenty-six teachers from three school districts participated in the week-long Institute and attended the fall NM Science Teacher Association conference.

Two Infrastructure Seed Awards (ISA), listed below, were made at the end of Year 1. Those projects have been in place through Year 2; outcomes to date are described in a later report section.

Synthesis, Structural Studies and Characterization of Charge Transfer Materials for Solar Cells Applications and Metal Organic Frameworks for Gas Storage; PI: Tatiana Timofeeva, New Mexico Highlands University

Building the Capacity to Monitor Algal Growth in Industrial-Scale Bioreactors at Santa Fe Community College; PI: Stephen Gomez, Santa Fe Community College

Interdisciplinary Innovation Working Groups (I-IWGs) were solicited in Year 2; one has been awarded and is scheduled to take place in May 2015.

A stoichiometry of the Rio Grande: Using novel observational techniques to understand the

sources, patterns, and dominant drivers of solutes and greenhouse gas emissions; lead: Jesus Gomez-Velez, New Mexico Tech

Project personnel have pursued additional funding in year 2, submitting 42 proposals for a total request of \$84,337,833, exceeding our target of 25 proposals per year. In Year 2 \$3,645,121 in additional funding has been awarded to date. Since project inception, EPSCoR participants have been awarded \$14,417,152 in extramural funding, representing a 22% success rate on proposals.

Management (91%):

The component teams met regularly, although the frequency varies based on the team's need and pace of progress; a record of meetings is entered into the ER Core reporting system. Components leads report on their progress during quarterly Management Team meetings and discuss challenges and new opportunities that have arisen. The Management Team also reviews charts provided by the Co-PI of their progress toward Strategic Plan metrics and budgetary information. We conducted a required Reverse Site Visit and address the recommendations from that panel in a later section of this report. Cross-component collaboration meetings have begun; the Bioalgal and Geothermal teams met in November 2014 and the Uranium and Social and Natural Science teams are scheduled to meet in April 2015. The CI team has met with several teams to discuss their data needs and will continue to work on data training and documentation in spring 2015. The Co-PI presented to the Council of University Presidents in December 2014 and the State EPSCoR Committee met in October 2014 and will meet again in Spring 2015. The Year 2 All Hands Meeting is scheduled for April 17, 2015.

Members of the NM EPSCoR office, including the Co-PI and Education and Diversity Coordinators conducted numerous campus visits: UNM (home institution), New Mexico Tech, NM State University (NMSU), Eastern New Mexico University (ENMU), Navajo Technical University, UNM Gallup, NMSU-Dona Ana, Clovis Community College, ENMU-Roswell, NMSU-Carlsbad, NMSU-Alamogordo, ENMU-Ruidoso, Southwestern Indian Polytechnic Institution (SIPI), NMSU-Grants, and Central NM Community College.

Significant Results:

In this section we report additional, specific research results for some components, results from seed funding, and describe leveraging of NSF programs.

Bioalgal Energy

The Bioalgal team demonstrated regrowth of *Galdieria sulphuraria* 5587.1 in aqueous phase of hydrothermal processed biomass, under laboratory conditions. They also demonstrated, for the first time, BOD, N and P removals from primary-settled wastewater by *Galdieria sulphuraria* 5587.1 under laboratory conditions. These results are comparable to literature data on other technologies. Work with the Turf Scrubber algal system showed single cell phytoplankton dominates in the polyculture (especially aphanothece sp, scenedesmus sp, frustulia sp, and nitzschia sp.) No observed filamentous algal genera were present in the polyculture. The grazers include chironomids, rotifers and ostracods. Encapsulating Living Cells for Biofuels and Bioproducts” through the NM EPSCoR STEMAP program in the summer of 2014. Two undergraduate students worked with faculty on two encapsulation projects. One demonstrated that thinner gels are better at maintaining photosynthetic function of encapsulated algae than thick

gels. The other research project showed that encapsulated polycultures of the electrogenic bacterium *Shewanella* and the alga *Chlamydomonas* were better at generating electricity than either monoculture and better than liquid polycultures. A new PhD student began work on culturing algae in wastewater and using buoyancy selection to maintain high lipid content algae in continuous culture.

Solar Energy

Team members investigated zinc sulfide as a promising catalyst due to its abundance, low cost, low toxicity, and conduction band position that enables the photo-reduction of CO₂ to formic acid. This study is the first to experimentally examine the photocatalytic differences between wurtzite and sphalerite under the parameters of size (micron and nanoscale) crystal lattice, surface area and band gap on productivity in the photo-reduction of HCO₃⁻.

The team also performed transient absorption and emission spectroscopic studies on a series of diimineplatinum(II) dichalcogenolenes, LPtL', revealing charge-separated dichalcogenolene→ diimine charge-transfer (LL'CT) excited state lifetimes that display a remarkable and nonperiodic dependence on the heteroatoms of the dichalcogenolene ligand. We also studied the effect of intra- and interchain order and nanomorphology on charge transfer doping and charge interactions in self-assembled π-stacked aggregate nanofibers of poly(3-hexylthiophene) (P3HT). These findings demonstrate that reliable control of polymer ordering can be harnessed to improve doping efficiencies past current plateaus, allowing new investigations into the roles of subtle structural factors on regulating charge interactions and transport.

Uranium Transport and Site Remediation

NMT efforts at developing techniques for determining uranium complexation have met with little success. Liquid chromatography columns purchased for this purpose appear to irreversibly retain uranium and do not produce meaningful chromatograms. An alternative eluent using methanol may be appropriate, however, this is incompatible with the plasma in an ICP instrument.

The organically-modified carbon material showed 91.6% adsorption with a single element standard of uranium by a simple recycling of the solution thru the resin. In the presence of calcium and magnesium of 1000 times greater concentration than uranium, absorbed calcium was 53%, absorbed magnesium was 38%, and absorbed uranium was 81% showing more specificity to uranium than other common metals.

Soil samples from Blue Gap Tachee have elevated uranium (0.06%) and batch experiments show a relationship between U and V. The deposits in the Blue Gap Tachee area are comprised of the primary minerals quartz, potassium feldspar, and kaolinite, which is consistent with the rock type (Cretaceous Mesa Verde Group) of the area. Uranium release from the mine waste deposits can occur with a 10 mM bicarbonate reagent at a pH of 8.3, with additional release (4 times more) with a 10 mM ascorbic acid reagent at a pH of 3.5. Dissolution and desorption are the primary mechanisms related to uranium mobility in the area.

The Rio Paguete in Laguna Pueblo has high uranium (130-700 μg/L) in surface water as it passes by the Jackpile mine. Approximately 4km downstream (south) of the Jackpile Mine the U concentration decreases by a factor of 25. Results from the Tsetah Wash study indicated low uranium levels within the wash (0.90-1.36 mg/kg) itself, with higher levels seen in the low-lying

areas adjacent to the wash (1.81-9.29 mg/kg). This is most likely due to the differences in sediment composition between these two depositional environments.

Geothermal Energy:

Our preliminary analysis within the Socorro-La Jencia Basins reveals some interesting observations. Along the Rio Grande Rift near the Bosque Del Apache Bird Sanctuary, elevated lithium concentrations occur in one of the Fish and Wildlife wells. This may be an upflow from the La Jencia-Socorro geothermal system. We plan to contact the Bosque Del Apache Bird Sanctuary staff and the town of Luis Lopez (which is located to the south of Socorro along the projected flow path) to determine the availability of additional existing geochemical data. In the southern Albuquerque Basin, Indian Hills has elevated lithium concentrations. This could be due to a geothermal upflow zone associated with the Socorro magma body.

Seed Awards

Two infrastructure seed awards were implemented in Year 2.

At NM Highlands University, the seed award was used to acquire instrumentation for analysis of thermal properties of materials and for obtaining large crystalline samples of materials. Two faculty members, two graduate students, and two undergraduate students have been involved in research related to charge transfer materials and metal organic frameworks with tunable luminescent properties. The team has submitted three proposals to NSF and one to DOE that will employ instrumentation acquired through this seed funding. In addition, six papers based on results obtained with this new instrumentation have been published or are under review. The instrumentation is used for education as well and has been included in laboratory components of Physical and Analytical Chemistry courses.

At Santa Fe Community College (SFCC), students are engaged in research that uses sensors obtained with the seed funds to monitor the commercial scale photobioractors in the SFCC Biofuels laboratory. Students study how pH, operating temperatures, chlorophyll content and other parameters affect the maximum algae production and biomass densities. The new sensors allow students and faculty to replicate growth conditions optimized in a lab setting to determine if they can be scaled up to industrial production levels. Capturing data in real time under continuous operation allows researchers to determine the performance of the photobioreactors and optimizes long term microalgal biomass productivity.

Leveraging NSF Awards

As mentioned above, our diversity efforts are leveraging the NM Alliance for Minority Participation award (#1305011), combining efforts to provide opportunities for students to communicate their research. The Earth Data Analysis Center (EDAC) that maintains our data infrastructure is becoming a DataONE member node (OCI-083094, ACI-1430508) and continues to participate in the CI Working Group that was initiated with our previous Track 2 award (EPS-0918635) and continues in the current award (IIA 13-29469). The NM Informal Science Education Network has received additional funding through an NSF subaward (DRL-123743). Several UNM project members from the Uranium and Social and Natural Sciences components are also involved in the CREST award (HRD-1345169) Center for Water and the Environment and Co-PI Daniel is a member of the award's internal advisory committee.

Key outcomes or Other achievements:

Combined, the 13 project components will complete 95% of Year 2 activities as listed in the Strategic Plan. Several components are also ahead of schedule in completing research; overall the project is well positioned to fulfill all research and education objectives.

Numbers of publications and presentations for each research theme are presented in the "Dissemination" section of the RPPR.

Broadening Participation

Participant data is provided in Template B, sent to the program officer. We had 202 participants in Year 2. Of those who provided demographic data (N=179), 46% are female and 33% are underrepresented minority (URM), including disabled. In Year 1, we reported 121 participants of which 49% were female and 29% were from underrepresented groups. Our 7-member External Advisory Board is 57% female, with one Native American member

Honors and Awards

David Hanson (UNM) was selected as a 2014 Kavli Fellow for the Japanese-American Frontiers of Science (JAFoS) Symposium, which is jointly sponsored by the U.S. National Academy of Sciences and the Japanese Society for the Promotion of Science. Kavli Fellows are young researchers (under 45) who have already made recognized contributions to science and who have been identified as future leaders in science. Fellows are selected by members of the National Academy of Sciences, the advisory board of the Kavli Foundation, and organizers of the Kavli/National Academy of Sciences Frontiers in Science Symposia series and Hanson was recognized for his work in CO₂ assimilation by plants and algae.

Karl Karlstrom (UNM) was named the 60th Annual Research Lecture awardee. This award is one of the highest honor the University of NM bestows on its faculty members in recognition of research/creative activity of exceptional merit.

Linnea Ista (UNM): Celebration Imagination 2014 Innovation Award, STC.UNM

Hongmei Luo (NMSU): Bromilow Award for Teaching Excellence and Bromilow Award for Research Excellence

Michael Heagy (NMT): New Mexico Tech 2014 Distinguished Researcher Award

Selena Connealy (NM EPSCoR): 2014 Service to Science Award from the New Mexico Science Teachers Association

NMAS Research Symposium Poster Awards: Brittney Dlouhy-Massengale (ENMU), Chaitanya Kukulta (NMSU), Maria Repasch (UNM), Nadia Mabrouk Mujynya (SFCC)

Saul Ruiz: SACNAS Poster Award

*** What opportunities for training and professional development has the project provided?**

Workforce Development (97%)

GUTC

Growing Up Thinking Computationally (GUTC) offered professional development workshops for teachers and support in classroom and afterschool clubs for middle school students during the 2014-2015 academic year. These activities expose participants to and engage them in the use of computational models for scientific inquiry and research thus also addressing workforce preparation issues. 327 students participated in GUTC activities; 48% participated in the afterschool clubs, 52% participated through school day classes that integrated the full GUTC curricular units. Overall, 64% of student participants were from historically underrepresented groups in STEM and Computing; 45% were female. Students ranged in grade from 4th through 12th grade with the majority of students in seventh grade.

We developed two new curricular units--Sustainability & Biofuels and Geothermal Energy. Within each 12-week unit students investigate a local problem, gather data, modify or build a computer model, and run experiments using the model as a virtual test bed. Seventeen GUTC clubs met at 17 school sites across Northern New Mexico; each was led by a team of a regular school day teacher acting as the club leader and a visiting STEM professional, software/IT professional, or master STEM teacher serving as the GUTC facilitator. Three club implementations took place during the regular school day as part of Technology or Integrated Science classes. The Fall Career Connections Conference and Field trip for 70 middle school students and 10 teachers was held at the Santa Fe Community College Sustainable Technologies department. The Spring Career Connections Conference and Field trip is planned for February 24th, 2015.

The Fall Roundtable took place at Santa Fe Community College; 65 GUTC club members met and interacted with students from other clubs. Club members demonstrated their projects and shared ideas before an audience consisting of STEM professionals, community members, facilitators, club leaders, family members, and fellow students in a symposium setting.. The Spring Roundtable is scheduled for May 2nd, 2015 and will include a Code-a-thon event.

FLPDI

The Faculty Leadership and Professional Development Institute (FLPDI) met for two days in September 2014 and continued to work with curriculum from the Micromessaging to Reach and Teach Every Student™ from National Alliance for Partnerships in Equity (NAPE). Undergraduate faculty from 12 institutions learned to use pedagogy that improves enrollment, retention & completion of girls and under-represented populations in STEM courses. A subsequent online follow-up session furthered the discussion of how culture shapes our biases and beliefs about people based on their age, gender, race, language, (dis)ability, or income level, often without our realization. Workshops will be held at three undergraduate institutions in spring 2015, involving additional faculty at those institutions. Three proposals for Community College/University colleague research teams were awarded, but only one undergraduate faculty member was able to make significant progress on the proposed project. This part of the FLPDI will be revised, as described in the Changes section of this report.

STEMAP

The eight-week STEM Advancement Program (STEMAP) began June 2, 2014 with one week of workshops at New Mexico Tech in Socorro, NM. Students spent the next seven weeks conducting

research with EPSCoR faculty and graduate students. The program culminated with student presentations to fellow students, colleagues, PIs, faculty, NM EPSCoR, friends, and family. In 2014, 43 students from 12 NM institutions applied to STEMAP and 11 from 7 institutions were selected: 55% female, 91% URM. They contributed to six research projects; two presented their research at the NM Academy of Science Research Symposium, one presented at the NM AMP Annual Conference, 3 presented at the National SACNAS conference and one presented at the AISES National Conference. We also provided an academic year program of six webinars that kept us in contact with the students and supported them in their pursuit of STEM. Webinars focused on using campus resources, making effective presentations, networking at conferences, mentorship, demystifying graduate school, and options for STEM-related career pathways. Recruiting for the 2015 cohort is underway; 33 applications have been received to date.

ICCE

The Institute for Creative and Cultural Entrepreneurship (ICCE) was launched to fill the void in support for entrepreneurs building new ventures in the creative economy. Market research in Year 1 led to the launch of Creative Startups Accelerator (CSA) in Year 2, the first in the nation designed by and for creative entrepreneurs. Over 40 mentors who have built highly successful businesses in the creative industries were engaged and new curriculum materials were completed and tested during the spring and summer of 2014. The 10 modules included leadership of new ventures, financing for startups, marketing and branding, and legal issues; 8 Guest Faculty participated in the weekly on-line classes. CSA received 60 applications from entrepreneurs in a range of creative fields; 80% were submitted by women and/or minority-owned startups. 12 finalists were selected; 9 are women/minority owned. The 10 online modules were followed by a week-long "Deep Dive" during which 30+ mentors and community leaders joined the cohort to provide advice, deliver technical assistance, and network with the entrepreneurs, while community events brought together nearly 200 people to network and engage in the startup ecosystem. CSA is currently improving our mentor pool, making changes and improvements to curriculum, and providing on-going support to the inaugural cohort. Additionally, we are continually growing the ecosystem of resources for creative entrepreneurs, including partnering to bring two international programs to Albuquerque: Creative Mornings and 99U/Behance.

Post Doc Workshop

From January 5th-8th, 2015, we held the first NM EPSCoR Postdoctoral Leadership Workshop at the Sevilleta Field Station, north of Socorro. A group of 20 postdoctoral fellows, including the NM EPSCoR supported post-docs, from New Mexico, Idaho, and Nevada learned about facilitating meetings, communicating science to the public, teaching approaches, entrepreneurship, ethics in science, submitting grant proposals to NSF, and work-life balance. A member of the board of the National Postdoctoral Association attended the entire workshop and provided a wealth of resources from that organization. The remote location and residential facilities afforded numerous opportunities for informal networking and rich discussion of career options and opportunities. Initial feedback from the participants was extremely positive.

Graduate Student Externships

Applications are now being accepted for graduate student externship experiences for the summer and fall 2015 semesters. Selected applicants will spend one semester conducting research at a partnering New Mexico University or research facility.

Other Research Training

The Osmotic Power team planned and hosted a 3-day workshop with 15 students and 5 faculty members from New Mexico Tech, New Mexico Highlands University, and Eastern New Mexico University participating in the presentation and hands-on activities. The objective of the workshop was to disseminate the know-how for the fabrication and characterization of membranes, which are the critical component for osmotic power generation.

* How have the results been disseminated to communities of interest?

Presentations

Project participants continue to make presentations about their work, including posters, panels, and conference presentations, summarized in the table below. Our target for Year 2 was 50 presentations; we have exceeded that number by a significant margin. The table below includes research presentations (n=29) at the NM Academy of Science Research Symposium which was attended by 128 individuals from 20 institutions, including universities, regional, community and tribal colleges, high schools, national labs, industry and state agencies.

Year 2 Presentations (all venues)

| Component | Presentations |
|--------------------------------------|---------------|
| Bioalgal Energy | 26 |
| Solar Energy | 7 |
| Osmotic Power | 11 |
| Uranium Transport & Site Remediation | 14 |
| Geothermal Energy | 15 |
| Social and Natural Science Nexus | 7 |
| Diversity | 3 |
| Workforce Development | 13* |

| | |
|---------------------|------------|
| Cyberinfrastructure | 9 |
| TOTAL | 105 |

*Does not include presentations made as part of Workforce Development activities described in other sections of this report. Workforce Development and Diversity presentations overlap but are not double-counted here.

Publications

In Year 2 project personnel generated 40 publications, including journal articles, conference proceedings, abstracts, news articles, and theses (see table below). While some submitted publications are still under review, we exceeded our Year 2 target of 15 peer-reviewed publications. Table E, submitted separately, includes only those publications that received EPSCoR funding support and have been published.

Year 2 Publications (all status)

| Research Component | Publications | Peer Reviewed |
|--------------------------------------|--------------|---------------|
| Bioalgal Energy | 10 | 6 |
| Solar Energy | 10 | 5 |
| Osmotic Power | 8 | 5 |
| Uranium Transport & Site Remediation | 2 | 2 |
| Geothermal Energy | 6 | 5 |
| Social and Natural Science Nexus | 0 | 0 |
| Cyberinfrastructure | 3 | 3 |
| TOTAL | 40 | 26 |

External Engagement (100%): The Informal Science Education Network (ISE Net) is our primary vehicle for disseminating NM EPSCoR research to the public and engaging learners of all ages in STEM. The Network focused on building their capacity to effectively communicate science to the public and gathering data that will inform exhibition development. The efforts reflect the formation of a Community of Practice of informal science institutions and practitioners in New Mexico. Researchers Crossey and Karlstrom led a public tour of geothermal sites in NM for one of the Network institutions.

In January 2015, staff from ten NM ISE Net institutions participated in the Reflecting on Practice coaching workshop facilitated by the Lawrence Hall of Science. Staff from an additional five institutions from outside NM ISE Net also participated. The goal of the workshop was to provide training and tools to improve the practice of informal science educators and to facilitate the formation of professional learning communities both within individual institutions and across the NM ISE Net. This enhances the capacity of the ISE Network to communicate research to public audiences, including school-age children.

In preparation for the museum exhibitions planned for years 3-5 that will specifically target NM EPSCoR research, five NM ISE Net institutions participated in a front-end exhibit evaluation led by Elsa Bailey and Wendy Meluch. This evaluation effort will ensure that the exhibits meet the needs of the museums' audiences, but it has also increased the museums' familiarity with and capacity to conduct exhibit evaluation. More than 40 museum staff and volunteers participated in data collection; evaluation results will be shared with museum and NM EPSCoR leadership in March 2015.

Radio & TV

Janie Chermak, co-lead for the Social and Natural Science Nexus component, has been invited to appear on radio programs to discuss economic impacts of changing oil revenues, drought, and hydraulic fracking. She has appeared three times on "Real Money with Ali Veshi" on Al Jazeera America and once on "Here and There with David Marash." On July 2, 2014, KFDA-TV Station interviewed Dr. Juchao Yan and his students at the algae site for the algae biofuel research at ENMU.

Website

In Year 2, the website team used data to improve the communication effectiveness of the project website (nmepscor.org). Data from a heuristic and interface evaluation (usability testing) conducted by the University of Tennessee enabled the web team to evaluate and improve the website's navigational structure, ease of use, and targeted improvements to terminology and content. Google Analytics, a free service provided by Google, generated detailed statistics that showed number, location and device preferences of website visitors. This information was used to design a mobile experience as well as determine the website's audience. Monthly meetings of web team and education and outreach staff were essential to shape updates and changes to the website, facilitating communication and understanding across roles. Website content was updated regularly and included 18 blog postings about project activities authored by students and staff. Social media vehicles are linked to the website; NM EPSCoR has 224 Facebook likes and 287 followers on Twitter. Our Mailchimp listservs (general, diversity, and education outreach) reach 718 unique subscribers. Email notices sent to our general list are opened by 26% of users, compared to an industry standard of 15.3%.

EPSCoR Template D, External Engagement, sent separately to the Program Officer, indicates the reach of presentations as well as ISE Net and workforce development activities. Over 4000 individuals have been engaged in outreach activities in Year 2. This does not include those reached through the website,

social media, newspaper articles, and radio programs.

*** What do you plan to do during the next reporting period to accomplish the goals?**

In Year 3, we will follow our Strategic Plan for all components.

The Bioalgal Energy team will continue to implement innovative new technologies that support biofuel production, pioneer the production of bio-crude from highly stable algal extremophiles and provide new knowledge in algal ecology, physiology, agriculture and biomass process engineering. They will continue to pursue initial research findings on the productivity of *Galdieria sulphuraria* and techniques of gel encapsulation. They will also expand relationships with municipalities and industries to investigate the use of algae for wastewater treatment and will further develop partnerships with companies that manufacture equipment relevant to these studies.

The Solar Energy team's magnetophotoluminescence facility at UNM's Center for High Technology Materials (CHTM) will be fully operational. The facility's new capabilities in time-resolved and magneto-optical spectroscopy will be used to characterize nanoparticle catalysts and conduct additional experiments to better understand excited state processes and, ultimately, design more efficient organic solar photovoltaic cells.

The Osmotic Team's Pressure Retarded Osmosis (PRO) and membrane fabrication systems will be complete allowing them to use custom-made membranes in the system and evaluate their effect on power generation. The osmotic power system will be repeatedly tested and enhanced based on test results. The team will continue to focus on encouraging undergraduates, especially women and under-represented minority students, to pursue careers in engineering.

The Uranium Transport and Site Remediation team will expand field studies in western New Mexico to study environmental impacts of previous uranium mining operations, including groundwater contamination and dust transport by wind. They will develop and test novel technologies for U remediation and de-mobilization and continue their collaborations with the Navajo Nation, Laguna Pueblo, and Sandia National Laboratories.

Work begun by the Geothermal Team to characterize the composition of waters and gases in geothermal systems will continue. They will deploy the magneto-telluric (MT) system acquired through this award in selected sites and will add new data to existing databases and link to other databases. The team will pursue initial observations into blind geothermal systems and refine and further develop 2- and 3-D models.

The Social and Natural Sciences Nexus team will have completed a statewide dynamic water budget—a key component to the overall system dynamics (SD) model that will link natural and human systems. Results from a statewide survey of attitudes and perceptions about energy and water issues will be analyzed and incorporated into the model as will input from other EPSCoR research components and related state agencies.

Diversity will continue to be a focus for *Energize New Mexico*; we will monitor project diversity data and use project meetings as opportunities to share strategies for enhancing diversity. Another round of Diversity Innovation Working Groups will be solicited. With AISES, we will create the Natives in STEM website, create content (photographs, videos, and profiles of STEM professionals), and debut the project at the 2015 AISES National Conference.

The components of our Workforce Development plan will continue: STEMAP, GUTC, FLPDI, and Creative Startups will recruit and engage new participants, using input from evaluation studies for program improvement. The first graduate externships will be implemented. The colleague research team component of FLPDI will be revised to work more closely with the STEMAP program, supporting those students to continue with research at their home institutions.

With completion of an online data documentation form, the Cyberinfrastructure team will accelerate the inclusion of other components' research data into the EPSCoR data repository. They will expand our interoperability with national and international data networks. They will continue to refine and implement a data management training course that will support project participants to more effectively manage data in their research programs.

External Engagement efforts by the Informal Science Education Network will include the development of an exhibition at the NM Museum of Natural History and Science, using input from the front-end study conducted in Year 2. ISE Net members will host meetings that engage EPSCoR researchers with the public in regions around the state.

Evaluation and Assessment activities will continue as planned, including administration of participant surveys after workshops and other activities, administration of the Collaboration Wizard tool, and surveys to assess impact of STEMAP participation, Innovation Working Groups and Seed Awards.

With the final faculty hire (NMSU) complete, Sustainability efforts will focus on awarding new Infrastructure Seed awards and continued efforts to secure extra-mural funding. We will host an "NSF Day" to support researchers in their efforts to pursue NSF funding and are in discussion with DOE EPSCoR to hold a similar event with their program officers. The NM ISE Net will implement a summer teacher workshop in northwestern NM (Farmington) and provide follow-up support to participants. To support implementation of Reflecting on Practice, we will facilitate four in-person sessions to investigate keystone topics for informal science educators, including how people learn in informal settings, learning conversations, and teaching with objects.

The Management plan will continue as implemented in Year 2 with continued focus on supporting cross-component collaboration and communication, use of evaluation results for program improvement, and consistent monitoring and feedback on program metrics and fiscal management.

Supporting Files

| Filename | Description | Uploaded By | Uploaded On |
|--|---|----------------|-------------|
| (Download) NMR114_EvalReportYear1.pdf | External Evaluator's Year 1 Report | Mary Jo Daniel | 02/25/2015 |
| (Download) EAC ResponseAug2014.pdf | NM EPSCoR Response to External Advisory Committee May 2014 Report | Mary Jo Daniel | 02/25/2015 |
| (Download) NM EPSCOR EAC Report May 2014 SUBMITTED.pdf | External Advisory Committee's Report from May 2014 Review | Mary Jo Daniel | 02/25/2015 |

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Products

Books

Book Chapters

Conference Papers and Presentations

- Martin Kirk, John Grey (2014). *High intra-chain order improves doping efficiency in J-aggregate poly(3-hexylthiophene) aggregate nanofibers*. New Mexico Academy of Science. Albuquerque, NM. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Shari Kelley, Matthew Sophy (2014). *Hydrogeologic investigation of the Ojo Caliente and Chise warm springs of the Winston Graben, Rio Grande rift, New Mexico*. Geothermal Resources Council Transactions. . Status = PUBLISHED; Acknowledgement of Federal Support = No
- Shari Kelley, Mark Person, Mussie Tewelde and Jim Witcher (2014). *Structural control of warm springs and wells in the Hillsboro-Lake Valley-Palomás Basin region of south-central New Mexico*. Geothermal Resources Council Transactions. . Status = PUBLISHED; Acknowledgement of Federal Support = No

Inventions

Journals

- Alexandr Fonaria, Jens C. Röderb, Hao Shenb, Tatiana V. Timofeevaa, K. Peter C. Vollhardt (2014). Toward Antikekulene: Angular 1,2-Di-, 2,3-Di-, and 1,2,15,16-Tetrachloro[6]phenylene. *Synlett*. 25 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1055/s-0034-1379140
- Anne Wilson, Robert R. Downs, W. Christopher Lenhardt, Carol Meyer, William Michener, Hampapuram Ramapriyan and Erin Robinson (2014). Realizing the value of a national asset: Scientific data. *Eos, Transactions American Geophysical Union*. 95 (50), . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1002/2014EO500006
- Archambault, S., Starbuck-Downes, C. M., Van Voorhies, W., Erickson, C. A., Lammers, P. (2014). Nannochloropsis sp. algae for use as biofuel: Analyzing a translog production function using data from multiple sites in the southwestern United States. *Algal Research*. 6 124. Status = PUBLISHED; Acknowledgment of Federal Support = No ; Peer Reviewed = Yes
- C. Ordonez, I. M. Pavlovetc and V. N. Khrustalev (2014). Crystal structure of 1,3-dimethyl-3-phenylpyrrolidine-2,5-dione: a clinically used anticonvulsant. *Acta Crystallographica Section E Structure Reports Online*. E70 0942. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1107/S1600536814016717
- Carlos Ordonez, Marina Fonari, Jennifer Lindline, Qiang Wei, and Tatiana Timofeeva (2014). How Structure-Directing Cations Tune the Fluorescence of Metal-Organic

- Frameworks. *Crystal Growth & Design*. 14 (5452), . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1021/cg5006133
- D. Lemke, R. González-Pinzón, Z. Liao, T. Wöhling, K. Osenbrück, R. Haggerty, and O. A. Cirpka (2014). Sorption and transformation of the reactive tracers resazurin and resorufin in natural river sediments. *Hydrology and Earth System Sciences*. 18 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.5194/hess-18-3151-2014
 - Daniel S. Alessi, Juan S. Lezama-Pacheco, Noemie Janot, Elena I. Suvorova, Jose M. Cerrato, Daniel E. Giammar, James A. Davis, Patricia M. Fox, Kenneth H. Williams, Philip E. Long, Kim M. Handley, Rizlan Bernier-Latmani, John R. Bargar (2014). Speciation and Reactivity of Uranium Products Formed during in Situ Bioremediation in a Shallow Alluvial Aquifer. *Journal, Book, Magazine or Newspaper Name: Environmental Science & Technology*. 48 12842. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1021/es502701u
 - González-Pinzón, R. A.S. Ward, C. Hatch, A.N. Wlotowski, K. Singha, M.N. Gooseff, R. Haggerty, J.W. Harvey, O. Cirpka, J. Brock (2015). A field comparison of multiple techniques to quantify groundwater-surface water interactions. *Freshwater Science*. 34 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1086/679738
 - Harvind K. Reddy, Tapaswy Muppanenia, Yingqiang Suna, Yin Lia, f, Sundaravadivelnathan Ponnusamy, Prafulla D. Patila, Peter Daileya, Tanner Schaubb, F. Omar Holguinb, Barry Dunganb, Peter Cookec, Peter Lammersd, Wayne Voorhiese, Xiuyang Luf, Shuguang Deng (2014). Subcritical water extraction of lipids from wet algae for biodiesel production. *Fuel*. 133 73. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1016/j.fuel.2014.04.081
 - J. Gao, B.W. Stein, A.K. Thomas, C. Aldaz, J.A. Garcia, J. Yang, M.L. Kirk, J.K. Grey (). Enhanced Charge Transfer Doping of J-Aggregate Poly(3-hexylthiophene) Nanofibers. *ACS Nano*. . Status = UNDER_REVIEW; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes
 - J. Pepin, M. Person, F. Phillips, S. Kelley, S. Timmons, L. Owens, J. Witcher and C. Gable (2015). Deep fluid circulation within crystalline basement rocks and the role of hydrologic windows in the formation of the Truth or Consequences, New Mexico low-temperature geothermal system. *Geofluids*. 15 139. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/gfl.12111
 - Keda Hu, Elena Pandres and Yang Qin (2014). Platinum-Segmented Polydiacetylenes. *Journal of Polymer Science Part A Polymer Chemistry*. 52 (18), 2662. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1002/pola.27286
 - Kumar, S., Mukherjee, M.M., Varela, M. (2013). Modulation of bacterial multidrug resistance efflux pumps of the major facilitator superfamily. *International Journal of Bacteriology*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

- Michael S. Massey, Juan S. Lezama-Pacheco, Morris E. Jones, Eugene S. Ilton, Jose M. Cerrato, John R. Bargar, Scott Fendorf (2014). Competing retention pathways of uranium upon reaction with Fe(II). *Geochimica et Cosmochimica Acta*. 142 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1016/j.gca.2014.07.016
- Person, M., Crossey, L., Phillips, F., Kelley, S., Karlstrom, K. (2015). Evidence for Long-Time Scale (> 10³ years) Changes in Hydrothermal Activity Induced by Seismic Events. *Geofluids*. 15 252. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/gfl.12113
- R. Castañeda, S. A. Antal, S. Draguta, T. V. Timofeeva and V. N. Khrustalev (2014). Crystal structure of 8-hydroxyquinoline: a new monoclinic polymorph. *Acta Crystallographica*. E70 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1107/S1600536814016110
- Roy JN, Babanova S, Garcia KE, Cornejo J, Ista LK, Atanassov P (2014). Catalytic biofilm formation by *Shewanella oneidensis* MR-1 and anode characterization by expanded uncertainty. *Electrochimica Acta*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1016/j.electacta.2013.07.075
- Selvaratnam, T., Pegallapati, A.K., Montelya, F., Rodriguez, G., Nirmalakhandan, N., Van Voorhies, W., Lammers, P.J. (2014). Evaluation of a thermo-tolerant acidophilic alga, *Galdieria sulphuraria*, for nutrient removal from urban wastewaters.. *Bioresource Technology*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1016/j.biortech.2014.01.075
- Sergiu Draguta, Andrey A. Yakovenko, Marina S. Fonari, and Tatiana V. Timofeeva (2014). Unusual Chemical Ratio, Zⁿ Values, and Polymorphism in Three New N-Methyl Aminopyridine-4-Nitrophenol Adducts. *Crystal Growth and Design*. 14 3423. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: DOI: 10.1021/cg500360f
- Tatiana Timofeeva, Victor N. Khrustalev, Bhupinder Sandhu, Samuel Bentum, Alexandr Fonari, Arcadius V. Krivoshein (2014). Absolute Configuration and Polymorphism of 2-Phebylbutyramide and α -Methyl- α -phenylsuccinimide. *Crystal Growth and Design*. 14 3360. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1021/cg500284q

Licenses

Other Products

- *Databases.*

We study the effect of subtle intra- and interchain order and nanomorphology on charge transfer doping and charge interactions in self-assembled π -stacked aggregate nanofibers of poly(3-hexylthiophene) (P3HT). Doping of the P3HT electronic ground state doping is achieved by adding varying amounts (w/w%) of the strong charge transfer dopant, 2,3,5,6-tetrafluoro-7,7,8,8-tetracyanoquinodimethane (F4-TCNQ) in solution nanofiber dispersions. Electron paramagnetic

resonance (EPR), electronic absorption, and Raman spectroscopy of F4-TCNQ-:P3HT+ species are used to track doping efficiency with dopant loading that are correlated with aggregate order and morphology.

- *Instruments or Equipment.*

For hollow fiber production used in osmotic power a godet system is needed. This godet system is essentially a roller to wind-up and wash the fibers produced. Key features of this system is fine speed control and the ability to completely submerge the fiber to help control the surface parameters though tension, temperature, and solvents.

Other Publications

- Juchao Yan (2014). *A Review on Treating Dairy Manure Effluents Using Microalgae Cultivated on an Algal Turf Scrubber*. Abstract from 2014 NM Research Symposium. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Chris Hirani (2014). *Batch extractions of metals from bicarbonate and ascorbic acid solutions.* Abstract from NM Research Symposium published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Ranjana Dangi, David Shultz, Benjamin Stein, Martin Kirk (2014). *Computational studies of electronic coupling involving π -pathways in donor-bridge-acceptor systems.* Abstract from NM Research Symposium published in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Nadia Mabrouk Mujynya, John Roesgen, David Hanson (2014). *Effect of encapsulation on algal photosynthesis.* Abstract from NMAS Research Symposium in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Selena Connealy, Eric Meyer, Deb Novak (2014). *Energize New Mexico Teacher Institute.* Abstract from NM Research Symposium published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Marisa Repasch, Karl Karlstrom, Laura Crossey, Valerie Blomgren (2014). *Fault networks of the Embudo Zone, northern New Mexico: Evaluating differential incision in the Rio Grande and implications for hydrothermal fluid pathways.* Abstract from NM Research Symposium published in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Julian Bojorquez (2014). *Hydrothermal Liquefaction.* Abstract from NM Research Symposium, published in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Tim Torres, Peter Lammers, Nicholas Csakan (2014). *Increasing productivity of algae culture to supply bio-crude oil production.* Abstract of presentation at NM Research Symposium published in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Devin Bruce, Claudia Petr, Michael Heagy, Daniel Leonard (2014). *Photons to Formate: Solar*

driven conversion of CO₂ to solar fuels. Abstract from NM Research Symposium, published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

- Kara Walter, Janie Chermak, Jen Thacher, Janak Joshi (2014). *Preferences on energy sources, trade-offs, and how they vary across New Mexico*. Abstract from NM Research Symposium, published in NM Journal of Science, v. 48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Elizabeth Jackson (2014). *Separation and Analysis of Produced Water for Osmotic Power Development*. Abstract from NM Research Symposium published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Thomas Guengerich, Kelsey Waggaman (2014). *Something In The Water: Tech Students Developing Alternative Energy Source*. Newspaper Article in El Defensor Chieftain. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Carlos Ordonez (2014). *The Influence of Structure-Directing Cations on Fluorescent MOFs*. Abstract from NM Research Symposium, published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Selena Connealy (2014). *The New Mexico Informal Science Education Network*. Blog Post on informalscience.org. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Benjamin Stein, David Shutlz, Christopher Tichnell, Martin Kirk (2014). *Unpaired electrons as reporters of excited state interactions*. Abstract from NM Research Symposium published in NM Journal of Science, v.48. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Patents

- *EPSCoR Reporting D2015-0021 Engineered, Modular Microbial Communities*. UNITED STATES. Application Date = 10/07/2014. Status = Submitted
- *TUNABLE METAL-ORGANIC FRAMEWORKS. Patent No. 61/980,227*. UNITED STATES. Application Date = 04/16/2014. Date Issued = 05/05/2014. Status = Granted

Technologies or Techniques

Thesis/Dissertations

- Thinesh Selvaratnam. *ENERGY EFFICIENT URBAN WASTEWATER TREATMENT USING GALDIERIA SULPHURARIA*. (2014). New Mexico State University. Acknowledgement of Federal Support = Yes
- Daniel Leonard. *MS Thesis: Effect of ZnS crystal structure and hole scavenger on the photocatalyzed reduction of bicarbonate to formate*. (2014). New Mexico Institute of Mining and Technology. Acknowledgement of Federal Support = Yes

Websites

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Participants/Organizations

What individuals have worked on the project?

| Name | Most Senior Project Role | Nearest Person Month Worked |
|--|---------------------------------|------------------------------------|
| Michener, William | PD/PI | 3 |
| Daniel, Mary Jo | Co PD/PI | 10 |
| Aageson, Tom | Faculty | 1 |
| Ali, Abdulmehdi | Faculty | 6 |
| Baca, Phyllis | Faculty | 1 |
| Baros, Shirley | Faculty | 1 |
| Benedict, Karl | Faculty | 1 |
| Bixby, Becky | Faculty | 1 |
| Cabaniss, Steve | Faculty | 1 |
| Cadol, Dan | Faculty | 1 |
| Cerrato, Jose | Faculty | 2 |
| Chermak, Janie | Faculty | 1 |
| Crossey, Laura | Faculty | 1 |
| Csakan, Nicholas | Faculty | 1 |
| Deng, Shuguang | Faculty | 1 |
| Fernald, Sam | Faculty | 1 |
| Fischer, Tobias | Faculty | 1 |
| Frolova, Liliya | Faculty | 1 |
| Giri, Ramesh | Faculty | 1 |
| Gonzalez-Pinzon, Ricardo | Faculty | 2 |
| Grey, John | Faculty | 1 |
| Guldan, Steve | Faculty | 1 |
| Hanson, David | Faculty | 1 |
| Hastings, Joe | Faculty | 1 |
| Heagy, Michael | Faculty | 2 |
| Hendrickx, Jan | Faculty | 1 |
| Herrera, Jose | Faculty | 1 |
| Holguin, Omar | Faculty | 1 |
| Huang, Frank | Faculty | 1 |
| Ista, Linnea | Faculty | 6 |
| Karlstrom, Karl | Faculty | 1 |
| Kelley, Shari | Faculty | 1 |

| Name | Most Senior Project Role | Nearest Person Month Worked |
|--|---------------------------------|------------------------------------|
| Kieft, Tom | Faculty | 1 |
| Kirk, Martin | Faculty | 1 |
| Lammers, Peter | Faculty | 1 |
| Leclerc, Corey | Faculty | 2 |
| Lee, Irene | Faculty | 6 |
| Loy, Alice | Faculty | 2 |
| Luo, Hongmei | Faculty | 2 |
| McArthur, Dana | Faculty | 2 |
| Nirmalakhandan, Nagamany | Faculty | 2 |
| Novak, Deb | Faculty | 1 |
| Parmenter, Robert | Faculty | 1 |
| Person, Mark | Faculty | 2 |
| Phillips, Fred | Faculty | 1 |
| Pontes, Olga | Faculty | 1 |
| Qin, Yang | Faculty | 1 |
| Ranasinghe, Mahinda | Faculty | 1 |
| Riley, Michael | Faculty | 1 |
| Rogelj, Snezna | Faculty | 1 |
| Sayre, Richard | Faculty | 1 |
| Schaub, Tanner | Faculty | 2 |
| Schuler, Andrew | Faculty | 1 |
| Shreve, Andrew | Faculty | 1 |
| Thacher, Jennifer | Faculty | 1 |
| Thomson, Bruce | Faculty | 2 |
| Tidwell, Vince | Faculty | 1 |
| Timlin, Jerilyn | Faculty | 1 |
| Timofeeva, Tatiana | Faculty | 1 |
| Van Voorhies, Wayne | Faculty | 1 |
| Varela, Manuel | Faculty | 3 |
| Walter, Charles | Faculty | 1 |
| Wei, Tie | Faculty | 1 |
| Wei, Qiang | Faculty | 3 |
| Weissmann, Gary | Faculty | 1 |
| Xu, Pei | Faculty | 1 |
| Yan, Juchao | Faculty | 2 |
| Gomez, Stephen | Community College Faculty | 1 |

| Name | Most Senior Project Role | Nearest Person Month Worked |
|---|---|------------------------------------|
| Blake, Johanna | Postdoctoral (scholar, fellow or other postdoctoral position) | 8 |
| Tian, Yongming | Postdoctoral (scholar, fellow or other postdoctoral position) | 6 |
| Barsamian, Arman | Other Professional | 6 |
| Chavez, Dina | Other Professional | 2 |
| Chee, Chelsea | Other Professional | 8 |
| Connealy, Selena | Other Professional | 6 |
| Cordova, Jennifer | Other Professional | 7 |
| Cornstock, Jocelyne | Other Professional | 1 |
| Coverdale, Melissa | Other Professional | 6 |
| Gallegos, Megan | Other Professional | 6 |
| Germann, Lina | Other Professional | 1 |
| Gibbs, Susan | Other Professional | 10 |
| Green, Yolanda | Other Professional | 6 |
| Grybko, Tamara | Other Professional | 1 |
| Hart, Tracy | Other Professional | 9 |
| Leigh, Kristin | Other Professional | 1 |
| Meyer, Eric | Other Professional | 1 |
| Meyer, Patricia | Other Professional | 10 |
| Prescott, Paige | Other Professional | 4 |
| Ratliff, Jesslyn | Other Professional | 1 |
| Ricketts, Jason | Other Professional | 1 |
| Romero, Carla | Other Professional | 6 |
| Willoughby, Natalie | Other Professional | 11 |
| Allen, Chris | Technician | 6 |
| Anderson, Jeremiah | Technician | 3 |
| Barrett, Hays | Technician | 3 |
| Brown, Jason | Technician | 1 |
| Budge, Amy | Technician | 1 |
| Clor, Laura | Technician | 1 |
| Dlouhy-Massengale, Brittney | Technician | 5 |
| Frey, Bonnie | Technician | 4 |
| Gleasner, Laura | Technician | 1 |
| Gonzales, John Paul | Technician | 9 |
| Hudspeth, William | Technician | 3 |
| Paz, Neil | Technician | 5 |

| Name | Most Senior Project Role | Nearest Person Month Worked |
|---|---------------------------------------|------------------------------------|
| Peterson, Ken | Technician | 7 |
| Psaila-Dombrowski, Maureen | Technician | 2 |
| Savickas, John | Technician | 6 |
| Schmugge, Tom | Technician | 1 |
| Scott, Soren | Technician | 4 |
| Serna, Isis | Technician | 6 |
| Walker, Steve | Technician | 10 |
| Avasarala, Sumant | Graduate Student (research assistant) | 4 |
| Bessa, Abebe | Graduate Student (research assistant) | 9 |
| Blair, Roxanne | Graduate Student (research assistant) | 5 |
| Blomgren, Valerie | Graduate Student (research assistant) | 12 |
| Chen, Gen | Graduate Student (research assistant) | 8 |
| Chilukloorie, Abhinay | Graduate Student (research assistant) | 2 |
| Gao, Jian | Graduate Student (research assistant) | 9 |
| Hawk, Anjanette | Graduate Student (research assistant) | 7 |
| Henkanette Gedara, Shanka | Graduate Student (research assistant) | 1 |
| Hewitt, Ian | Graduate Student (research assistant) | 7 |
| Holzgang, Antonia | Graduate Student (research assistant) | 2 |
| Hu, Keda | Graduate Student (research assistant) | 1 |
| Huang, Di | Graduate Student (research assistant) | 5 |
| Irwin, Suzy | Graduate Student (research assistant) | 6 |
| Jackson, Elizabeth | Graduate Student (research assistant) | 4 |
| Joshi, Janak | Graduate Student (research assistant) | 5 |
| Kanapathippillai, Nitharsan | Graduate Student (research assistant) | 1 |
| Kukutla, Chaitanya | Graduate Student (research assistant) | 12 |
| Lee, Hyunwoo | Graduate Student (research assistant) | 9 |
| Leonard, Daniel | Graduate Student (research assistant) | 4 |
| Little, Susan | Graduate Student (research assistant) | 5 |
| Martinez, Adam | Graduate Student (research assistant) | 9 |
| McGibbon, Christopher | Graduate Student (research assistant) | 2 |
| Minteer, Allison | Graduate Student (research assistant) | 2 |
| Nana O Kuffour, Benjamin | Graduate Student (research assistant) | 9 |
| Ohoueu, Marie-Josiane | Graduate Student (research assistant) | 2 |
| Ordonez, Carlos | Graduate Student (research assistant) | 2 |
| Pan, Hanqing | Graduate Student (research assistant) | 2 |
| Patterson, Brian | Graduate Student (research assistant) | 1 |

| Name | Most Senior Project Role | Nearest Person Month Worked |
|---|---------------------------------------|------------------------------------|
| Pepin, Jeff | Graduate Student (research assistant) | 8 |
| Pfupajena, Tanaka | Graduate Student (research assistant) | 4 |
| Reddy, Harvind Kumar | Graduate Student (research assistant) | 4 |
| Repasch, Marisa | Graduate Student (research assistant) | 8 |
| Roesgen, John | Graduate Student (research assistant) | 5 |
| Sandoval Donahue, Magdalena | Graduate Student (research assistant) | 1 |
| Sarker, Swagotom | Graduate Student (research assistant) | 3 |
| Saville, Samantha | Graduate Student (research assistant) | 6 |
| Schatz, Mitchell | Graduate Student (research assistant) | 7 |
| Selvaratnam, Thinesh | Graduate Student (research assistant) | 6 |
| Smith, Geoffrey | Graduate Student (research assistant) | 4 |
| Stein, Benjamin | Graduate Student (research assistant) | 6 |
| Stutz, Samantha | Graduate Student (research assistant) | 2 |
| Walter, Kara | Graduate Student (research assistant) | 6 |
| Warneke, Nadine | Graduate Student (research assistant) | 2 |
| Wichhart, Derek | Graduate Student (research assistant) | 2 |
| Woolsey, Emily | Graduate Student (research assistant) | 3 |
| Zhang, Su | Graduate Student (research assistant) | 6 |
| Arellano, David | Undergraduate Student | 2 |
| Arko, Brian | Undergraduate Student | 1 |
| Baymiller, Max | Undergraduate Student | 4 |
| Bazan, Alexandria | Undergraduate Student | 2 |
| Bazan, Shelby | Undergraduate Student | 5 |
| Bicknell, Kelsey | Undergraduate Student | 1 |
| Blom, Luke | Undergraduate Student | 6 |
| Bojorquez, Julian | Undergraduate Student | 3 |
| Bowers, Fenton | Undergraduate Student | 1 |
| Brady, Owen | Undergraduate Student | 1 |
| Bruce, Devin | Undergraduate Student | 2 |
| Chavez, Gary | Undergraduate Student | 2 |
| Chavez, Olivia | Undergraduate Student | 1 |
| Cleghorn, Carly | Undergraduate Student | 1 |
| Draelos, Jennifer | Undergraduate Student | 1 |
| Grano, Roger | Undergraduate Student | 1 |
| Grulke, Tanner | Undergraduate Student | 1 |
| Hernandez, Vivian | Undergraduate Student | 4 |
| Hirani, Chris | Undergraduate Student | 2 |

| Name | Most Senior Project Role | Nearest Person Month Worked |
|--|---------------------------------|------------------------------------|
| Hoo, Jasmine | Undergraduate Student | 2 |
| Johnson, Adrianna | Undergraduate Student | 2 |
| Laight, Pablo | Undergraduate Student | 2 |
| Li, Yitian | Undergraduate Student | 3 |
| Mabrouk Mujynya, Nadia | Undergraduate Student | 2 |
| Mayer, Alex | Undergraduate Student | 6 |
| McClory, Aysha | Undergraduate Student | 2 |
| McLain, Sarah | Undergraduate Student | 1 |
| Petr, Claudia | Undergraduate Student | 2 |
| Policastro, Michael | Undergraduate Student | 1 |
| Pratt, Tyler | Undergraduate Student | 5 |
| Ruiz, Saul | Undergraduate Student | 3 |
| Rust, Lauren | Undergraduate Student | 1 |
| Sanchez, Cassandra | Undergraduate Student | 6 |
| Sewell, Torrie | Undergraduate Student | 2 |
| Sloan, Joliviette | Undergraduate Student | 1 |
| Stelly, Stephen | Undergraduate Student | 1 |
| Thomas, Graham | Undergraduate Student | 1 |
| Thunder, Keith | Undergraduate Student | 2 |
| Torres, Tim | Undergraduate Student | 1 |
| Vigil, Raelynn | Undergraduate Student | 2 |
| Waggaman, Kelsy | Undergraduate Student | 4 |
| Wang, Qiang | Undergraduate Student | 1 |
| Weikel, Lynn | Undergraduate Student | 2 |
| Willie, Shaina | Undergraduate Student | 2 |
| Montoya, Sa'Rae | Technical School Student | 3 |
| Baker, Asha | Other | 6 |

Full details of individuals who have worked on the project:

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Most Senior Project Role: PD/PI

Nearest Person Month Worked: 3

Contribution to the Project: Principal Investigator

Funding Support: University of New Mexico

International Collaboration: No

International Travel: No

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Most Senior Project Role: Co PD/PI

Nearest Person Month Worked: 10

Contribution to the Project: Co-PI and Associate Director

Funding Support: University of New Mexico

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Global Center Cultural Entrepreneurship

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 6

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Community College

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

Karl Benedict

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure, Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

Becky Bixby

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Social Natural Science Nexus

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Diversity, External Engagement, Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Social Natural Science Nexus

Funding Support: NMSU

International Collaboration: No

International Travel: No

Tobias Fischer**Email:** fischer@unm.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Geothermal Energy**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Liliya Frolova****Email:** lfrolova@nmt.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Uranium**Funding Support:** New Mexico Tech**International Collaboration:** No**International Travel:** No**Ramesh Giri****Email:** rgiri@unm.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Algal Biofuels**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Ricardo Gonzalez-Pinzon****Email:** gonzaric@unm.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 2**Contribution to the Project:** Uranium**Funding Support:** UNM**International Collaboration:** No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Social Natural Science Nexus

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

Joe Hastings

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Explora!

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Solar Power co-lead and STEMAP Coordinator

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Diversity

Funding Support: Western NM University (WNMU)

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels co-lead

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Solar Power co-lead

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels co-lead

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Irene Lee

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 6

Contribution to the Project: Diversity, Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Workforce Development

Funding Support: Global Center Cultural Entrepreneurship

International Collaboration: No

International Travel: No

Hongmei Luo

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Power

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

Dana McArthur**Email:** dana.mcarthur@sfcc.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 2**Contribution to the Project:** Workforce Development**Funding Support:** Santa Fe Community College**International Collaboration:** No**International Travel:** No**Nagamany Nirmalakhandan****Email:** nkhandan@nmsu.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 2**Contribution to the Project:** Algal Biofuels**Funding Support:** New Mexico State University**International Collaboration:** No**International Travel:** No**Deb Novak****Email:** debra.novak@state.nm.us**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Workforce Development**Funding Support:** New Mexico Museum of Natural History and Science**International Collaboration:** No**International Travel:** No**Robert Parmenter****Email:** bparmenter@vallescaldera.gov**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Geothermal Energy, Social Natural Science Nexus**Funding Support:** Valles Caldera Nation Preserve**International Collaboration:** No

International Travel: No

Mark Person

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Geothermal Energy, Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Fred Phillips

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Olga Pontes

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: UNM

International Collaboration: No

International Travel: No

Mahinda Ranasinghe

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Solar Team; new faculty hire

Funding Support: NM Tech

International Collaboration: No

International Travel: No

Michael Riley

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Snezna Rogelj

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Richard Sayre

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico Consortium

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels, Osmotic Power

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

Andrew Shreve

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

Jennifer Thacher

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure, Social Natural Science Nexus

Funding Support: UNM

International Collaboration: No

International Travel: No

Bruce Thomson

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Osmotic Power, Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

Vince Tidwell

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Social Natural Science Nexus

Funding Support: Sandia National Labs

International Collaboration: No

International Travel: No

Jerilyn Timlin

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: Sandia National Laboratories

International Collaboration: No

International Travel: No

Tatiana Timofeeva

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: New Mexico Highlands University

International Collaboration: No

International Travel: No

Wayne VanVoorhies

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

Manuel Varela

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 3

Contribution to the Project: Algal Biofuels

Funding Support: ENMU

International Collaboration: No

International Travel: No

Charles Walter

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: New Mexico Museum of Natural History and Science

International Collaboration: No

International Travel: No

Tie Wei**Email:** twei@nmt.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Osmotic Power**Funding Support:** New Mexico Tech**International Collaboration:** No**International Travel:** No**Qiang Wei****Email:** qwei@nmhu.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 3**Contribution to the Project:** Osmotic Power**Funding Support:** New Mexico Highlands University**International Collaboration:** No**International Travel:** No**Gary Weissmann****Email:** weissman@unm.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Uranium**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Pei Xu****Email:** pxu@nmsu.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Osmotic Power**Funding Support:** New Mexico State University**International Collaboration:** No

International Travel: No

Juchao Yan

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Most Senior Project Role: Faculty

Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels, Osmotic Power

Funding Support: ENMU

International Collaboration: No

International Travel: No

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Most Senior Project Role: Community College Faculty

Nearest Person Month Worked: 1

Contribution to the Project: Seed Awardee, Diversity IWG

Funding Support: SFCC

International Collaboration: No

International Travel: No

Johanna Blake

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Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)

Nearest Person Month Worked: 8

Contribution to the Project: Uranium Group

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)

Nearest Person Month Worked: 6

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 6

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 2

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 8

Contribution to the Project: Diversity, Workforce Development

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Diversity, External Engagement, Workforce Development

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 7

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 10

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Explora!

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 9

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: External Engagement, Workforce Development

Funding Support: Explora!

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Workforce Development

Funding Support: Explora!

International Collaboration: No

International Travel: No

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International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 6

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Most Senior Project Role: Other Professional

Nearest Person Month Worked: 11

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 6

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 3

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 3

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 5

Contribution to the Project: Algal Biofuels

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

Bonnie Frey

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Most Senior Project Role: Technician

Nearest Person Month Worked: 4

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 9

Contribution to the Project: Workforce Development

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 3

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 5

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 7

Contribution to the Project: Social Natural Science Nexus

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 2

Contribution to the Project: Management/Administration

Funding Support: Santa Fe Institute

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 6

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Technician

Nearest Person Month Worked: 1

Contribution to the Project: Social Natural Science Nexus

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

Isis Serna**Email:** iserna@epscor.unm.edu**Most Senior Project Role:** Technician**Nearest Person Month Worked:** 6**Contribution to the Project:** Management/Administration**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Steve Walker****Email:** salto@nmsu.edu**Most Senior Project Role:** Technician**Nearest Person Month Worked:** 10**Contribution to the Project:** Social Natural Science Nexus**Funding Support:** New Mexico State University**International Collaboration:** No**International Travel:** No**Sumant Avasarala****Email:** savasarala87@unm.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 4**Contribution to the Project:** Geothermal Energy, Uranium**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Abebe Besha****Email:** abebe@nmsu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 9**Contribution to the Project:** Social Natural Science Nexus**Funding Support:** New Mexico State University**International Collaboration:** No

International Travel: No

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Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 5

Contribution to the Project: Workforce Development

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 12

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 8

Contribution to the Project: Solar Power

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 9

Contribution to the Project: Solar Power

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 7

Contribution to the Project: Cyberinfrastructure Team

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 7

Contribution to the Project: Social Natural Science Nexus

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: ENMU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 5

Contribution to the Project: Solar Power

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Cyberinfrastructure

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Osmotic Power

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 5

Contribution to the Project: Social Natural Science Nexus

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 12

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 9

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Solar Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 5

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

Adam Martinez**Email:** amartine@nmt.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 9**Contribution to the Project:** Osmotic Power**Funding Support:** New Mexico Tech**International Collaboration:** No**International Travel:** No**Christopher McGibbon****Email:** mcgibbon@unm.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 2**Contribution to the Project:** Geothermal**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Allison Minter****Email:** Allison.Minter@enmu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 2**Contribution to the Project:** Algal Biofuels**Funding Support:** Eastern New Mexico University**International Collaboration:** No**International Travel:** No**Benjamin Nana O Kuffour****Email:** benbiok@nmsu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 9**Contribution to the Project:** Social Natural Science Nexus**Funding Support:** New Mexico State University**International Collaboration:** No

International Travel: No

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Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 2

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Highlands University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Highlands University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Energy Team

Funding Support: NMT

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 8

Contribution to the Project: Geothermal Energy

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Algal Biofuels

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 8

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 5

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 3

Contribution to the Project: Solar Power

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 6

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 7

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Algal Biofuels

Funding Support: NMSU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Solar Power

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Social Science Nexus

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

Derek Wichhart**Email:** dwichhar@unm.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 2**Contribution to the Project:** Algal Biofuels**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**Emily Woolsey****Email:** eewoolz@gmail.com**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 3**Contribution to the Project:** Geothermal Energy**Funding Support:** New Mexico Tech**International Collaboration:** No**International Travel:** No**Su Zhang****Email:** szhang@edac.unm.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 6**Contribution to the Project:** Cyberinfrastructure**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**David Arellano****Email:** david.arellano@enmu.edu**Most Senior Project Role:** Undergraduate Student**Nearest Person Month Worked:** 2**Contribution to the Project:** Algal Biofuels**Funding Support:** ENMU**International Collaboration:** No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 4

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 2

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 5

Contribution to the Project: Management/Administration

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 6

Contribution to the Project: Geothermal

Funding Support: NMT

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 3

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Most Senior Project Role: Undergraduate Student

Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power Team

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Power

Funding Support: New Mexico Highlands University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico State University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Uranium

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Solar Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Uranium

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: UNM-Los Alamos (UNM-LA)

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Power

Funding Support: UNM-Valencia (UNM-V)

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 5

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 3

Contribution to the Project: Algal Biofuels

Funding Support: New Mexico Highlands University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Cyberinfrastructure, Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 6

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Geothermal Energy

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: Santa Fe Community College

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Algal Biofuels

Funding Support: UNM

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Algal Biofuels

Funding Support: ENMU

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 4

Contribution to the Project: Osmotic Power

Funding Support: New Mexico Tech

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 1

Contribution to the Project: Osmotic Power

Funding Support: Eastern New Mexico University

International Collaboration: No

International Travel: No

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Nearest Person Month Worked: 2

Contribution to the Project: Solar Power

Funding Support: Northern NM College (NNMC)

International Collaboration: No

International Travel: No

Shaina Willie**Email:** shainawillie@yahoo.com**Most Senior Project Role:** Undergraduate Student**Nearest Person Month Worked:** 2**Contribution to the Project:** Uranium**Funding Support:** Western NM University (WNMU)**International Collaboration:** No**International Travel:** No**Sa'Rae Montoya****Email:** raerae1@nmsu.edu**Most Senior Project Role:** Technical School Student**Nearest Person Month Worked:** 3**Contribution to the Project:** Algal Biofuels**Funding Support:** NMSU**International Collaboration:** No**International Travel:** No**Asha Baker****Email:** buhita@unm.edu**Most Senior Project Role:** Other**Nearest Person Month Worked:** 6**Contribution to the Project:** Administrative/support staff**Funding Support:** UNM**International Collaboration:** No**International Travel:** No**What other organizations have been involved as partners?**

| Name | Type of Partner Organization | Location |
|---|---|-----------------|
| Eastern New Mexico University | Academic Institution | Portales, NM |
| Explora! | Other Organizations (foreign or domestic) | Albuquerque, NM |
| Northern NM College | Academic Institution | Espanola, NM |

| Name | Type of Partner Organization | Location |
|--|---|-------------------|
| Sandia National Laboratories | Other Organizations (foreign or domestic) | Albuquerque, NM |
| Santa Fe Community College | Academic Institution | Santa Fe, NM |
| Santa Fe Institute | Other Nonprofits | Santa Fe, NM |
| Valles Caldera National Preserve | State or Local Government | Jemez Springs, NM |
| Western New Mexico University | Academic Institution | Silver City, NM |
| Global Center for Cultural Entrepreneurship | Other Nonprofits | Santa Fe, NM |
| Los Alamos National Laboratory | Other Organizations (foreign or domestic) | Los Alamos, NM |
| National Museum of Nuclear Science and History | Other Nonprofits | Albuquerque, NM |
| New Mexico Consortium | Other Nonprofits | Albuquerque, NM |
| New Mexico Highlands University | Academic Institution | Las Vegas, NM |
| New Mexico Institute of Mining and Technology | Academic Institution | Socorro, NM |
| New Mexico Museum of Natural History and Science | Other Nonprofits | Albuquerque, NM |
| New Mexico State University | Academic Institution | Las Cruces, NM |

Full details of organizations that have been involved as partners:

Eastern New Mexico University

Organization Type: Academic Institution

Organization Location: Portales, NM

Partner's Contribution to the Project:

Financial support

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: Contributing to the Bioalgal and Osmotic Components

Explora!

Organization Type: Other Organizations (foreign or domestic)

Organization Location: Albuquerque, NM

Partner's Contribution to the Project:

Financial support

In-Kind Support

Facilities
Collaborative Research

More Detail on Partner and Contribution: Museum will host an EPSCoR-related public exhibit; one of the leading members of NM ISE Net.

Global Center for Cultural Entrepreneurship

Organization Type: Other Nonprofits
Organization Location: Santa Fe, NM

Partner's Contribution to the Project:
Financial support
In-Kind Support
Collaborative Research

More Detail on Partner and Contribution: GCCE supports cultural entrepreneurs and the communities they live in; they are developing and implementing the Institute for Creative and Cultural Entrepreneurship

Los Alamos National Laboratory

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Los Alamos, NM

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Scientists from Los Alamos National Laboratory are participating in several research components.

National Museum of Nuclear Science and History

Organization Type: Other Nonprofits
Organization Location: Albuquerque, NM

Partner's Contribution to the Project:
Financial support
In-Kind Support
Facilities
Collaborative Research

More Detail on Partner and Contribution: Museum will host an EPSCoR-related public exhibit; one of the leading members of NM ISE Net.

New Mexico Consortium

Organization Type: Other Nonprofits

Organization Location: Albuquerque, NM

Partner's Contribution to the Project:

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: The New Mexico Consortium (NMC) is a non-profit corporation formed by the three New Mexico research universities to advance scientific research and education. Researchers are playing a key role in Bioalgal research component

New Mexico Highlands University

Organization Type: Academic Institution

Organization Location: Las Vegas, NM

Partner's Contribution to the Project:

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: Contributing to the Solar and Osmotic components

New Mexico Institute of Mining and Technology

Organization Type: Academic Institution

Organization Location: Socorro, NM

Partner's Contribution to the Project:

Financial support

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: New Mexico Tech is one of the three research institutions involved in the project; faculty and students contribute to Osmotic Power, Solar, Uranium, Geothermal research components and are the lead on the STEM Advancement outreach activity.

New Mexico Museum of Natural History and Science

Organization Type: Other Nonprofits

Organization Location: Albuquerque, NM

Partner's Contribution to the Project:

Financial support
In-Kind Support
Facilities
Collaborative Research

More Detail on Partner and Contribution: Museum will host an EPSCoR-related public exhibit; one of the leading members of NM ISE Net.

New Mexico State University

Organization Type: Academic Institution

Organization Location: Las Cruces, NM

Partner's Contribution to the Project:

Financial support
In-Kind Support
Facilities
Collaborative Research

More Detail on Partner and Contribution: One of the three primary research institutions; contributing to the Bioalgal, Solar, Osmotic, and Uranium components.

Northern NM College

Organization Type: Academic Institution

Organization Location: Espanola, NM

Partner's Contribution to the Project:

Other: Participates in FLPDI and STEMAP

More Detail on Partner and Contribution:**Sandia National Laboratories**

Organization Type: Other Organizations (foreign or domestic)

Organization Location: Albuquerque, NM

Partner's Contribution to the Project:

Collaborative Research

More Detail on Partner and Contribution: Scientists from Sandia Labs are participating in several research components, including Bioalgal, Solar, and Social/Natural Science Nexus.

Santa Fe Community College

Organization Type: Academic Institution

Organization Location: Santa Fe, NM

Partner's Contribution to the Project:

Financial support

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: Leading the Faculty Leadership and Professional Development Workforce Development Activities

Santa Fe Institute

Organization Type: Other Nonprofits

Organization Location: Santa Fe, NM

Partner's Contribution to the Project:

Financial support

In-Kind Support

Facilities

Collaborative Research

More Detail on Partner and Contribution: Leading the Growing Up Thinking Computationally (GUTC) Workforce Development activities

Valles Caldera National Preserve

Organization Type: State or Local Government

Organization Location: Jemez Springs, NM

Partner's Contribution to the Project:

Facilities

Collaborative Research

More Detail on Partner and Contribution: The Valles Caldera Trust was created by the Valles Caldera Preservation Act of 2000 to preserve and protect the historic Baca Ranch of New Mexico's Jemez Mountains. The Valles Caldera National Preserve is a key field site for the geothermal research component.

Western New Mexico University

Organization Type: Academic Institution

Organization Location: Silver City, NM

Partner's Contribution to the Project:

Collaborative Research

Other: Diversity IWG

More Detail on Partner and Contribution: Participates in FLPDI and STEMAP

Have other collaborators or contacts been involved? Yes

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Impacts

What is the impact on the development of the principal discipline(s) of the project?

The impact on disciplinary knowledge is evidenced by the peer-reviewed publications that have resulted from research activities (table provided in previous section); individual publication records have been entered into research.gov. A general description of some impacts follows.

Geothermal: We are developing a methodology for locating blind geothermal systems using trace element concentrations combined with solute transport theory. We have begun to develop more complex, three-dimensional-hydrochemical models to test the hydrologic windows hypothesis. We have generated a detailed three-dimensional model that includes multiple fault blocks and accommodation zones using the Lagrit mesh generation software at Los Alamos. The hydrogeologic framework model is based on four geologic cross sections. We used the hydrothermal model pgeofe in this project (Cohen et al. 2009). The model consisted of 403,000 nodes and over 2,290,000 tetrahedral elements (see Figure below) using the Los Alamos Lagrit mesh generation package. The model was run on the NM Tech cluster Rosemary (24 cores). Simulations took about 5 days to run for 0.5 million years.

Solar: We have developed new ways for metal-ligand control of photoprocesses, which suggest that heteroatom effects can be utilized to further modify excited state lifetimes in a controlled manner. The photodriven semiconductor substrates of ZnS have moved from the nanoparticle solution phase to ultra high vacuum thermal deposition with highly controlled layering of semiconductor material to 100 nm \pm 5 nm. We have developed (in collaboration with the Shultz group at NCSU) new modes for the important exciton-polarion (i.e. trion) interaction in semiconducting polymers and polymer solar cells using MCD spectroscopy. We demonstrated that reliable control of polymer ordering can be harnessed to improve doping efficiencies past current plateaus, allowing new investigations into the roles of subtle structural factors on regulating charge interactions and transport.

GUTC is learning about best approaches to integrating Computer Science concepts and practices into the school day curriculum. During this pilot phase we are comparing approaches in terms of scaffolds necessary, continuity with existing curriculum, and student engagement.

What is the impact on other disciplines?

Nothing to report.

What is the impact on the development of human resources?

Algal co-team lead David Hanson was promoted to full Professor, July 1, 2014. His role in NM EPSCoR

made an important contribution to his promotion. The new faculty members hired with EPSCoR support are making significant contributions to research through presentations and publications.

STEMAP:

Based on student self-reports and video testimony (available on our website at <http://www.nmepscor.org/education-and-outreach/programs/stem-advancement-program-stemap>), the STEMAP program had significant positive impacts on the participating students. Of the 11 students in the first cohort, three students have transferred from a two-year program to a four-year Bachelor's degree program and two additional students have been accepted to four-year programs for next year. Two of the students are applying to graduate programs in STEM fields. Two students are continuing in their current degree program and two have taken a semester off due to family demands. Two students received awards for research presentations – one from the National SACNAS Conference and the other at the NMAS Research Symposium. One student is also a candidate for a summer internship and contributed research to a presentation that resulted in a \$70K award to a UNM faculty member by the Gates Foundation. Our external evaluator plans to administer follow-up surveys to track impacts in the future.

D-IWG's

Three Innovation Working Groups on diversity were held at the end of Year 1. They focused on how to reach and engage underrepresented student populations—through afterschool programs, different pathways towards bachelor degrees in STEM, or creating a long-term educational research program to help identify the drivers of success. One IWG resulted in a statewide collaborative effort to submit a proposal to the NSF-IUSE program. If funded, the project will get educational data housed long-term within the state. That would allow assessment of educational interventions within STEM disciplines, focused primarily and initially on Chemistry and Biology. The IWG focused on afterschool programs has led to a proposal to the Noyce foundation to fund STEM in afterschool system-building work for the NM Afterschool Alliance, a conference session to share resources and statistics on STEM in afterschool, and the addition of STEM language to an afterschool funding bill at the state level.

Institutional Engagement and Collaboration

Through the Faculty Leadership and Professional Development Institute (described in Accomplishments), we have engaged ten primarily undergraduate institutions (PUI), including community and tribal colleges, in RII activities. The Year 1 cohort of STEMAP students represented 7 undergraduate institutions; applications for Cohort 2 have been received from 14 institutions to date. The two Seed Awards made in the spring of Year 1 engaged two PUIs in research and education activities. Both of those institutions are now fully engaged in RII research components (Bioalgal and Solar). The Diversity IWGs also engaged non-research institutions in RII efforts.

Energize New Mexico encourages and supports collaborative efforts across institutions and disciplines. The Research, CI, Diversity, Workforce Development and External Engagement teams have initiated new and strengthened existing collaborations within the jurisdiction and beyond to support and extend research and education efforts. In Year 2, project participants increased the number and strength of collaborations with industry partners. The number of collaborations and collaborators are reported in EPSCoR Template C, Collaborations. Some of the collaborations that will enhance our research and education efforts are described below.

Collaborations

Members of the Bioalgal team met with Toivo Kallas (University of Wisconsin-Oskosh and Algoma Algal Biotechnology) to develop a materials transfer agreement to put their isoprene producing cyanobacteria in the UNM encapsulation system. This collaboration is being pursued through a current concept paper to ARPA-e as part of their OPEN call. The Bioalgal team has also established a cooperative agreement with Las Cruces Wastewater Treatment Plant (WWTP) to set up a field demonstration/testbed at the WWTP. Dr. Yan (ENMU) has started partnership discussions with Southwest Cheese Co., LLC (SWC), trying to use the wastewater from SWC to grow algae in both indoor and outdoor environments.

The Osmotic Power team continues its collaboration with Apache Corporation to obtain high TDS produced waters for analysis at the NMSU/ENMU labs and for testing of the PRO system at NMT. In addition to the collaboration with the Apache Oil Corp, the team is also working with Trevi Systems in CA on membrane fabrication. Trevi Systems develops processes that use an innovative and highly energy efficient Forward Osmosis (FO) process to produce clean water from saltwater, brackish water or industrial wastewater at much lower cost and energy use compared to existing technologies. Our knowledge about how various parameters affect membrane properties has advanced significantly. Based on the knowledge that we acquired, the team also designed and constructed equipment for membrane fabrication that may be adopted by Trevi Systems in the near future.

The Geothermal team continues its collaborations with local industry and agency partners, including them as instructors and guest lecturers in their newly designed Geothermal course. They have also co-located some of their field sites with a local geophysical consultant.

The Uranium Team are successfully maintaining strong collaborative relationships with tribal governments (Navajo and Laguna Pueblo) and state agencies (NM Environment Department) that are necessary for them to accomplish their research objectives.

The Social and Natural Science Nexus team has worked with representatives of the NM Energy and Minerals Department to gather input for the perceptions survey and is working with the Office of the State Engineer to develop the statewide dynamic water budget.

Collaborations also support our workforce development efforts. The NM EPSCoR Education Outreach Coordinator is now the co-chair of the Math and Science Advisory Council that provides input to the NM Public Education Department. Co-PI Daniel serves on a statewide STEM Collective Impact team that is providing policy language for proposed legislation related to STEM education efforts. Both individuals are also board members of the New Mexico Partnership for Math and Science Education.

In addition to these external collaborations, project synergies are developing between project components and between colleagues within institutions, across departments. In Fall 2014, the Geothermal and Bioalgal teams held a joint meeting to explore areas of shared interest. They agreed to exchange information about ongoing activities and future plans, with discussion about synergy and developing a proposal for an Interdisciplinary Innovation Working Group. The Uranium and Social and Natural Science Nexus Teams have scheduled a joint collaboration meeting in April 2015. Researchers have also contributed to workforce development and external engagement efforts by contributing to the development of GUTC curricula, presentations to NM ISE Net members, and public presentations at ISE Net museums.

What is the impact on physical resources that form infrastructure?

The Bioalgal component has developed new capabilities for conducting hyperspectral imaging of live cells in the UNM Physics Dept. and analyzing data via the Sandia National Laboratories (SNL) multivariate curve resolution program. Students worked with UNM and SNL researchers to use hyperspectral imaging at UNM to study photosystem distribution under a range of environmental conditions. This was the first time the UNM hyperspectral equipment was used to conduct analyses formerly only possible at Sandia National Laboratories. Students can now collaborate with SNL on related projects without having to get clearance to work at SNL. Photon Systems Instruments (PSI), a company with over 70 employees that has been producing scientific instrumentation for algal and plant biology for over 20 years, opened its first international branch in Albuquerque, NM as part of a collaboration with David Hanson (UNM Biology). PSI has shipped a new LED array, a fluorescence meter, and an algal photobioreactor for use in Hanson's lab for EPSCoR experiments, including graduate research on the effects of encapsulation on algal function.

Optisciences, a US company manufacturing equipment for measuring photosynthesis, brought a newly developed instrument to UNM Biology for testing in August 2014.

At NMSU, the Bioalgal team installed 15-L fermenter for production of high-density inoculum for testbed facility, and a multiwavelength microplate reader for the chemical analysis, enzymatic assays and high-throughput growth experiments. They Purchased and installed a UV/VIS spectrometer, DI system, vacuum hardware for Mass Specs and Nano LC system. Other equipment include: a combustion CHNOS Analyzer, FT-IR spectrometer, FT-ICR PetroOrg Mass Spectral Chemical Analysis Software and a new 3x300L testbed being developed at the Las Cruces Wastewater Treatment Plant.

The Osmotic Power team's system at NMT consists of the power generation subsystem (Pressure-Retarded Osmosis or PRO), the HFM fabrication subsystem (Fiber Spinning, Fiber Dope Preparation, and Potting), and the HFM characterization subsystem (Water Permeability Measurement, S-factor Evaluation, and OD/ID Measurement). Several pieces of ancillary testing and characterization equipment, including dead-end water flux/salt rejection testing apparatus, viscometer, and contact angle analyzer, were also constructed or acquired.

The magnetic circular dichroism magnet system for the Solar team has been purchased and is now at UNM. The Fluorolog spectrometer has now been installed in the Chemistry Department at NMT. As a result of an Infrastructure Seed Award, NM Highlands University has acquired a Thermo Gravimetry/Differential Thermal Analyzer (TG/DTA) HITACHI STA7200, which is used for evaluation of stability, phase transitions and degradation rates of synthesized materials. NMHU also acquired a Polar Bear Plus – Crystal Growth System, Cambridge reactor Design Inc, Multi-sample multi-temperature (-40-120°C) crystal growth system for growth of organic and organic-inorganic mixed materials single crystals.

An experimental economics lab has been completed at UNM by the Social and Natural Sciences Nexus team. It will be used to conduct economic experiments and was used as key infrastructure in a recent proposal to NSF EPSCoR's Track 2-FEC program.

What is the impact on institutional resources that form infrastructure?

The Geothermal team has created an innovative educational structure that draws upon and connects resources across campuses and with industry. "Geothermal Processes" is a graduate seminar course taught in Spring 2015 jointly at UNM in Earth & Planetary Sciences and at NM Tech and NM Bureau of Geology. Guest lecturers from academia, industry and the national laboratories provide additional

lectures. The class is offered using web technology with lectures presented at UNM, NMT and from 'the road'. The class includes several field trips to NM geothermal localities or prospects and introduces students to the field of geothermal energy systems, preparing them for future employment and research opportunities in this field. Students will be exposed to a wide variety of field, laboratory, and quantitative exploration methods. Approximately 15 students across both campuses are registered. We hope to expand in this model in future years to reach a broad segment of the NM EPSCoR partnership.

Dave Hanson of the Bioalgal team has also been working to enhance the educational experience of students by engaging in new pedagogical techniques. He has participated in training on using a "flipped" classroom strategy in Biology courses as well as other active learning techniques.

What is the impact on information resources that form infrastructure?

The work of the Cyberinfrastructure team in their interactions with the other project components continues to emphasize the importance of considering both effective data management during the research process and planning for the transition of research data products into an archive where they may be effectively discovered and accessed by others. This is a substantial conceptual shift for many researchers and is a continuous learning process to instill these habits into the research process.

Based upon feedback from the project's cross-component CI leadership team, additional storage and computational capacity will be acquired before the end of the project year. The balance between storage and computation will be determined by the projected data types and volumes that will be generated by the research teams in Year 2 and into Year 3.

We are also working to implement a workshop for project personnel on basic programming skills for using large datasets put on by the Software Carpentry group. This workshop will be a joint effort of NM EPSCoR and UNM's University Library Research Data Services.

What is the impact on technology transfer?

Dave Hanson (UNM) is developing a new STEM Entrepreneur's Fellowship program and used his collaboration with Photon Systems Instruments (PSI) as an initial test of the program's model. He has been working with a local entrepreneur to pursue NSF SBIR funding.

Two additional provisional patents were awarded in Year 2.

What is the impact on society beyond science and technology?

The NM Informal Science Education Network (ISE Net) is systematically linking the members of their communities to both academic research efforts and the state's Public Education Department.

Participants in the Faculty Leadership and Professional Development Institute have become aware of and explored the roots of their biases and are applying their understanding to making their undergraduate courses more inclusive and supportive of diversity.

Initial evaluative data from the Creative Startups Accelerator indicate significant increases in participating startups' knowledge, networks, and access to mentors, investors, and market leaders. Qualitative feedback included comments like this, "I was amazed by the depth and practical applicability of the curriculum, the accessibility of instructors and mentors, the quality of Deep

Dive accommodations. The amount of mentors and overall thoroughness in general impressed me.” Nine out of ten participants "enthusiastically recommend" the program to entrepreneurs. One startup has raised \$550,000 in seed funding since completing the program.

Co-PI Daniel continues to work with the NM Economic Development Department to revise the state's Science and Technology Plan. Several EPSCoR researchers have contributed to focus groups that provided input to the revision.

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Changes/Problems

Changes in approach and reason for change

The General Programmatic Terms and Conditions (PTC) related to reporting have been addressed throughout the body of the RPPR and in the EPSCoR Reporting templates that have been submitted separately to the Program Officer. There are no Jurisdiction Specific Terms and Conditions on this award.

Attached is the Year 1 Evaluation Report from our external evaluator, Minnick and Associates. The report provides findings and recommendations grouped in five areas: People, Material Infrastructure, Research, Knowledge Generation and External Engagement. The report states: "Overall, Energize NM appears to be on schedule and following the strategic plan developed in Year 1. There is a lot of excitement and people energy in the project that should result in many scientific discoveries and a stronger workforce and engaged public in New Mexico." The Management Team reviewed the report and found that it aligned with recommendations from the External Advisory Committee so that the response to the EAC also responded to recommendations by the External Evaluator. The Year 2 External Evaluation report will be completed in July 2015.

The External Advisory Committee (EAC) met in May 2014, in conjunction with the statewide All Hands Meeting. Their Year 2 meeting was advanced to the end of Year 1 in response to a request in their initial report to meet more project personnel. Their second report and our response to their recommendations are attached. Overall, the report states, "For all its complexity, multiple components, and multiple institutions, New Mexico EPSCoR appears to be making good progress in the science components, education and public outreach (EPO), and in meeting diversity goals." Recommendations fell into three broad categories: increasing integration and connectivity between components, cyberinfrastructure improvements, and increased engagement with industry. We worked throughout Year 2 to address their recommendations as described in our response.

We also participated in a Reverse Site Visit; the Management Team reviewed those recommendations, drafted a response that was submitted to, and approved by, NSF. All components are actively identifying potential industry partners and engaging with them to pursue research of mutual interest and benefit. We are continuing to work with STC.UNM to pursue opportunities related to IP licensing. As requested, each of the research components identified technical performance metrics that were appropriate to their individual research practices and plans. They continue to use these metrics as benchmarks against which they chart their progress annually. As outlined in our response, we have continued to focus our diversity efforts on undergraduates involved in the STEMAP program, providing support through webinars and personal contacts throughout the academic year. In addition, our plans to revise the FLPDI

program to more closely align with and support academic year research of STEMAP students (described below) will contribute to our focus on enhancing the educational experience of these students.

Changes in Management

After a review of progress, project leadership, in consultation with relevant component leads, determined that a change in leadership of the Osmotic and Uranium components was necessary. Consequently, Bruce Thomson (UNM) withdrew as co-lead of the Osmotic Power component and became co-lead of the Uranium component, replacing Steve Cabaniss (UNM) whose responsibilities as department chair did not leave him sufficient time to be the component co-lead. Dr. Qiang Wei, from NM Highlands University, was selected as the co-lead of the Osmotic team and a subaward was created for NMHU, moving funds from UNM. As a component lead, Wei is a member of the Management Team.

The CI Team is now led by Karl Benedict (no change), Shirley Baros, and John Savickas; Baros and Savickas have therefore joined the Management Team.

Charles Walter, Director of the NM Museum of Natural History and Science, resigned his position. Debra Novak, Education Director for the Museum, has taken the position on the Management and Workforce Development teams previously held by Mr. Walter.

As of February 2015, Peter Lammers, co-lead of the Bioalgal component, left NMSU. His role is being filled by Omar Holguin and Nirmala Khandan who were previously involved in the Bioalgal Energy team work. Holguin and Khandan are now on the Management Team.

Our cognizant program officer was notified of all component lead/management team changes. The changes resulted in minimal disruption and improved productivity in some cases. The current Management Team consists of 22 members; 14% URM and 36% female. Note: the number of RII Leadership Team members on Table B is higher than this as it counts those who were on the team at any point during the project year.

Program Changes

In Year 2, the Uranium component received approval to reallocate funds from purchasing a piece of equipment that would not serve the group's research objectives to bring in additional expertise (microbiologist). The changes were implemented and the additional expertise enabled the team to better examine the effects of microbial activities on chemical speciation and mobility of Uranium and related contaminants. This work will continue in Year 3.

One component of the Faculty Leadership and Professional Development Institute (FLPDI)—the colleague research teams—was not highly successful in its first implementation. The plan was to provide grants to four community college faculty to attend a course in using large data sets as a basis upon which they proposed data-intensive research projects related to NM EPSCoR research that could be implemented at their home campuses. Three faculty members were awarded grants and attended the course. However, they were not able to effectively implement research projects with their students. In order to more closely connect this effort to the main NM EPSCoR research thrusts while also supporting our diversity efforts, the FLPDI coordinator and workforce team members will restructure this program facet. Once the Year 2 STEMAP students have been selected, four faculty members who have been involved in FLPDI and are at the same institution as STEMAP students will be invited to meet the

relevant STEMAP mentors and learn about their research projects. They will then develop plans to support those students at their home institutions throughout the academic year to continue work related to the summer research projects. The FLPDI and Diversity coordinators will provide support in conjunction with other existing program components.

Actual or Anticipated problems or delays and actions or plans to resolve them

There have been no significant changes to the Strategic Plan since it was approved by NSF and we do not anticipate any changes that will result in major delays in achieving project objectives.

Changes that have a significant impact on expenditures

Our Year 2 expenditures, including obligations, are 103% of budget. From project inception through year 2, our expenditures, including obligations, are 91% of budget.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals

Nothing to report.

Significant changes in use or care of biohazards

Nothing to report.

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Special Requirements

Responses to any special reporting requirements specified in the award terms and conditions, as well as any award specific reporting requirements.

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