

Nevada Governor's Office of
ECONOMIC DEVELOPMENT

Empowering Success



NEVADA'S KNOWLEDGE FUND

Driving Innovation and Commercialization

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Nevada's Knowledge Fund

A significant factor in the sustained success of the New Nevada economy will be the development and introduction into the market of new products, services and business models. Created by Assembly Bill 499 and first funded in 2013, the Knowledge Fund spurs research, innovation and commercialization in Nevada.

Intended to provide funding to hire leading researchers, match research grants and form innovative commercialization teams at the Nevada System of Higher Education (NSHE) institutions, the Knowledge Fund makes technology-based economic development (TBED) a priority for the benefit of all.

Overseen by the Nevada Governor's Office of Economic Development (GOED), NSHE institutions submit applications for projects that could benefit from Knowledge Fund support. GOED, together with the Knowledge Fund Advisory Council, selects the projects that are best suited for funding.

Thanks to this support, researchers across the Silver State have been busy cultivating the intellectual property that will continue the diversification of our economy for years to come.

Knowledge Fund to date: \$27.9 million

UNR: \$8.8 million

UNLV: \$7.9 million

DRI: \$11.2 million

University of Nevada, Reno (UNR)

Nevada's land-grant university founded in 1874, the University of Nevada, Reno ranks in the top tier of best national universities by U.S. News and World Report and is steadily growing in enrollment, excellence and reputation. The University serves more than 22,000 students. Part of the Nevada System of Higher Education, the University is home to the University of Nevada, Reno School of Medicine, University of Nevada Cooperative Extension and Wolf Pack Athletics. Through a commitment to world-improving research, student success and outreach benefiting the communities and businesses of Nevada, the University has impact across the state and around the world.



Knowledge Fund Projects at UNR

Nevada Center for Applied Research (NCAR)

The University's Nevada Center for Applied Research (NCAR) is designed to attract and develop industry by providing access to University resources. NCAR has a market-responsive, adaptable and collaborative approach.

NCAR offerings include an innovative wet-lab incubator, the Biosciences Entrepreneurial Lab, for entrepreneurs and startup companies primarily in the biotech space. NCAR's Shared Research Facilities program encompasses and facilitates access to more than 45 campus facilities, laboratories and core centers, as well as highly experienced staff with expertise in operating equipment and labs, designing and conducting experiments and analyzing data.

This important service for business and industry is also improving the ability of faculty to coordinate and share these valuable resources. Additionally, NCAR helps with the creation of multidisciplinary research-based initiatives such as Intelligent Mobility and Water Innovation Campus.

- Leveraged initial \$3.1 million Knowledge Fund investment to bring in \$9.7 million in grants, contracts, gifts/investments and facility-use and fee-for-service agreements.
- Fifteen companies currently on-contract with NCAR and have business operations based on campus.
- Startups, spinouts or established companies are expanding operations by using some university resources.
- More than 70 companies engaged.
- More than 120 jobs created.
- Eight venture-funded startups created.

Inception: October 2015
Total Funds Awarded (all years): \$4.7M
Status: Current Project
Project End Date: June 30, 2019



Biosciences Entrepreneurial Laboratory, NCAR

The Biosciences Entrepreneurial Laboratory is a wet lab incubator space at the University of Nevada, Reno, available to business and entrepreneurs through customized facility-use or fee-for-service agreements.

Its creation responds to the cost prohibitive nature of startups in the biosciences and the opportunity to accelerate the growth and success of bioscience entrepreneurship in Northern Nevada. The initial Biosciences Entrepreneurial Laboratory was at capacity within six months of opening, much sooner than projected.

High Performance Computing Facility, NCAR

A new, user-driven, high-performance computing cluster is boosting research capacity and supporting the latest research applications such as artificial intelligence, machine learning, robotics, computational biology, computational neurosciences, bioinformatics and big data.

The significant cluster, named Pronghorn, offers 30 times more computing power than the university's previous high-performance system. In addition to funding through the Knowledge Fund, the

development of Pronghorn has attracted industry and community support including a donation from long-time university supporter and groundbreaking researcher Mick Hitchcock and support by Switch, a global technology company and leader in the design and operation of advanced data centers.

Switch is providing more than \$3.4 million in critical technology infrastructure support services through space, power and security for five years at Switch TAHOE RENO, The Citadel Campus.



Intelligent Mobility, NCAR

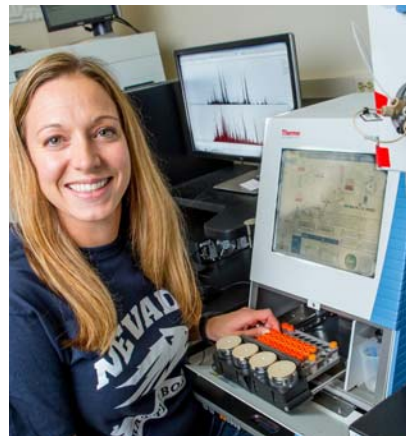
Safe, clean and efficient mobility is a foundation for sustainable economies and communities. The University of Nevada, Reno's Intelligent Mobility initiative brings together researchers, citizens, ideas, projects and resources to meet this grand challenge and explore solutions for safe, clean and efficient transportation. This pioneering effort includes testing of synchronized mobility technologies in the complex, urban "living lab" environment of the greater Reno-Sparks-Carson City area in Northern Nevada.

Intelligent Mobility has attracted a coalition of public and private partners including:

- Fraunhofer Institute for Transportation and Infrastructure Systems IVI, Europe's largest application-oriented research organization, which brings global perspective and expertise in transportation and infrastructure systems to the effort.
- Cities of Reno, Sparks and Carson City.
- Dell EMC.
- Governor's Office of Economic Development.
- Nevada Department of Motor Vehicles.
- Nevada Department of Transportation.
- Regional Transportation Commission of Washoe County.
- Electric bus manufacturer Proterra.
- Switch.
- Blynscy.
- Velodyne LiDAR.
- Filament.



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Mick Hitchcock PhD Nevada Proteomics Center, NCAR

This core research facility provides advanced proteomic analysis at competitive rates. The Nevada Proteomics Center serves both public and private entities by assisting investigators qualitative and quantitative characterization of proteins in biological matrices such as plasma/serum, tissue, cell lines and other biological materials. This represents a valuable service resource to many businesses in the biotech space.



Nevada Advanced Autonomous Systems Innovation Center, NAASIC

The Nevada Advanced Autonomous Systems Innovation Center (NAASIC), a division of the Nevada Center for Applied Research, addresses emerging and complex problems in the development, application, and commercialization of advanced-autonomous systems through industry-university partnerships, innovation, cooperative research and entrepreneurship.

NAASIC also contributes to development of a technologically advanced workforce by providing educational opportunities to university students.

Inception: March 2014

Total Funds Awarded (all years): \$3.5M

Status: Current Project (now as part of NCAR)

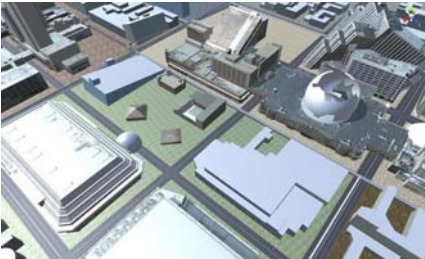
Project End Date: June 30, 2019

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First Responder Interface for Disaster Information (FRIDI), NAASIC

Building on research supported by the Knowledge Fund grant to advance UAV safety, collision avoidance and failure-resistant control, project lead David Feil-Seifer and research collaborators have developed simulation platforms to support the use of multi-robot systems in emergency or disaster mitigation scenarios with local applications.

The First Responder Interface for Disaster Information (FRIDI) includes a computer-based interface for the ground control station as well as a companion interface for portable devices. Developed in collaboration with industry and local agencies, the system's goal is to enhance the situational awareness, response time, and other operational capabilities of first responders during a disaster remediation mission. Project highlights included:



Developed disaster mitigation training simulator for emergency management personnel to develop skills controlling multi-UAV swarms. This simulator shows the City of Reno after a simulated earthquake and allows an operator to fly a simulated UAV swarm through this disaster zone to accomplish tasks to help mitigate the effects of the scenario.

Decentralized control algorithm for a team of UAVs that can autonomously and actively track the dynamic boundaries of a wildfire, which is a critical but dangerous task for firefighters. The UAVs can effectively share the vision of the field while maintaining safe distance in order to avoid in-flight collision. This algorithm has been tested in simulations and performed well.



Mine Inspection Robotics, NCAR

This research-based project is conducted through the university's Autonomous Robots Lab and is supported by NCAR and, through it, the Knowledge Fund. This project aims to develop aerial robotic systems capable of providing autonomous exploration, inspection, mapping and surveillance in underground mines. The relevant environments are dark, GPS-denied and can be particularly narrow. Beyond the associated research contributions, emphasis is put on field demonstration in collaboration with the mining industry

Inception: March 2018
Total Funds Awarded (all years): \$398K
Status: Current Project
Project End Date: December 31, 2019

Detect & Avoid: Improving UAV Vehicle Safety

As the State of Nevada has been designated an FAA UAV test site with the task of integrating UAVs into civilian airspace, there are several technical obstacles to overcome before these systems can be efficiently operated as part of day-to-day life, with safety a paramount concern.

This project explored critical safety concerns in the context of Same-Day Drone Delivery (SDDD). There is a real concern of operator overload as the ration of UAVs controlled to operators grows. The project worked to develop and test alert systems for detecting obstacles and evaluate strategies for informing the operator.

The project team has developed (using Federal funds) a multi UAV simulator in urban environment and conducted testing to evaluate the proper operation of the simulator. The funds awarded to the project also paid for the stay of Prof. Andreas Frey from Ingolstadt University of Applied Sciences, Germany.

Total Funds Awarded (all years): \$140K
Status: Past Project
Project End Date: May 31, 2017
NSHE-Industry Unmanned Autonomous Systems (UAS) Collaboration Program

University of Nevada Las Vegas (UNLV)

Since its first classes were held on campus in 1957, UNLV has transformed itself from a small branch college into a thriving urban research institution. Along the way, this urban university has become an indispensable resource in one of the country's fastest-growing and most enterprising cities. UNLV is a public research institution committed to rigorous educational programs, and promoting well-being and achievement through education, research, scholarship, and creative activity for our diverse faculty, students, staff, alumni, and community.



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Knowledge Fund Projects at UNLV

International Gaming Institute's Global Gaming Capital Initiative, GGCI

Inception: March 2014
Total Funds Awarded (all years): \$3.5M
Status: Current Project
Project End Date: June 30, 2019

The Global Gaming Capital Initiative evolved from the Knowledge Fund supported Center for Gaming Innovation (CGI). It seeks to reinforce Nevada's position as the world's thought leader in gaming and hospitality, which remain the largest contributors to Nevada's overall economy and of jobs for Nevadans.

The acceleration of globalization and the rise of new technologies threaten the continued viability of Nevada's gaming-related economy, and focused investment in research and innovation is necessary to maintain Nevada's competitive advantage. The UNLV International Gaming Institute (IGI) has proposed a strategy that will:

1. Provide two reports (one focusing on design and one focusing on industry, government, and academic strategy) that will research, define, and develop recommendations for "The Integrated Resort of 2050." Specifically, this project will develop initiatives that ensure that stakeholders are doing all that they can to ensure the long-term health of the gaming/hospitality sector in Nevada.
2. Build upon a successful existing model to create innovative and commercially viable games that attract the next generation of gamblers through the Center for Gaming Innovation (CGI).
3. Increase the efficiency, productivity, and profitability of non-gaming operations in integrated resorts through the collaboration of industry, entrepreneurs, and UNLV student inventors through the Hospitality Lab.
4. Examine the costs and speed to market challenges for gaming innovations by conducting research that explores these key issues, and then advocating for more consistent regulation across jurisdictions where appropriate.
5. Strengthen the economy of Nevada by developing initiatives that expand the leadership role of women in the gaming industry, thereby expanding the pool of talent available to lead this industry.



This is a project explicitly envisioned by Governor Sandoval and GOED, and blossomed in ways never dreamed of, and now drives innovation with Nevada's most lucrative import/export (tourism/gaming).

- Patents have been filed for 50 unique student innovations.
- Nine patents have issued with a half dozen more pending.
- Three students have launched their own businesses.
- Several students have been placed in Nevada companies with a focus on developing innovation.
- Eight student games have been licensed.
- Six table games have been approved for use in Nevada casinos.
- Hospitality Lab held what is believed to be the world's first-ever class on e-sports management and business modeling for the modern integrated resort.
- IGI's Executive Development Program continues to be world's most prestigious gaming leadership academy with attendees representing 10 countries and virtually every major gaming jurisdiction.
- International Center for Gaming Regulation fully operational.
- Ensure world's regulators have access to the best research and education.
- Servicing international jurisdictions in South Africa, Austria, Japan, Brazil and provinces in Canada.

Nevada Institute of Personalized Medicine, NIPM

Nevada has almost no infrastructure to diagnose and treat genetic disorders that affect 1 in 10 Nevadans. Our economy continues to export genetic health care services and billions of dollars to neighboring states. To address this issue, UNLV with additional support from the Knowledge Fund, founded and established the Nevada Institute of Personalized Medicine (NIPM) and hired a team of expert genetics scientists, clinicians, and staff.

Aligned with its goal of economic development, NIPM has launched two spinoff companies.

Food Genes and Me LLC (foodgenesandme.com) creates and sells personalized diets based upon an individual's genetic blueprint.

Heligenics uses a new single cell analysis technology invented in NIPM to advance genetic diagnostics of cancer and other diseases.

NIPM's medical genetics clinic has diagnosed and treated more than 400 patients in Las Vegas. NIPM built and runs the only genome sequencing service Lab, which is instrumental to development of a modern medical school.

NIPM provides facilities, equipment, research core services, mentoring, and other types of research infrastructure to create a culture where both faculty and students can thrive. Students and postdoctoral fellows receive high-intensity training in many different aspects of personalized medicine.

Recently, NIPM became a biomedical center of excellence with an \$11.4 million award from the National Institutes of Health. The award represents the first COBRE (center of biomedical research excellence) program led by UNLV. NIPM will leverage the award to foster research efforts at UNLV and across Nevada.

The NIPM COBRE is the first in the nation to focus exclusively on personalized medicine as well as the first Nevada personalized medicine initiative peer-reviewed by a national committee. The award represents the culmination of efforts put forth by a dedicated and hardworking team of staff and faculty at NIPM as well as at collaborating organizations, fueled by seed funding from the Knowledge Fund.

More than 45 experts participated in the application process, and the submission had more than 60 letters of support from recognized organizations or experts in the field. Key local collaborators include UNLV's National Supercomputing Institute and the Lou Ruvo Center for Brain Health.

Personalized medicine is based on the concept that a person's unique DNA can guide effective treatment and disease prevention. The main goals of the COBRE grant are to advance the use of genomics and genetics in personalized medicine through cutting-edge research discovery, to build a center of excellence that fosters new investigator independence, and to collaborate with key strategic partners.

Inception: March 2014
Total Funds Awarded (all years): \$3.25M
Status: Current Project
Project End Date: December 31, 2018

Demand Responsive Rumble Strips for Advance and Safe Mobility

This project includes the redesign, prototyping and field testing of a Demand Responsive Rumble Strip (DRRS) mechanism, which becomes active only when needed. This mechanism is to be installed on travel lanes upstream of locations with safety concerns.

Making the rumble strips active only when needed prevents drivers from becoming accustomed to the effects of the rumble strips while minimizing the noise as compared to permanent rumble strips. Hence, drivers' attention will be regained making them aware of the presence of pedestrians in the roadway. In addition, in the context of autonomous

vehicles, the proposed mechanism provides redundancy, so as to minimize the likelihood of a crash as a consequence of system failures and/or malfunction.

In the context of connected vehicles, the proposed mechanism can be activated through communication with vehicles and pedestrians. UNLV has filed a non-provisional patent of the invention in partnership with the UNLV Office of Economic Development. Corresponding technical drawings and details have been provided to the U.S. Patent and Trademark Office.

Inception: April 2018
Total Funds Awarded (all years): \$150K
Status: Current Project
Project End Date: June 30, 2019

Fraunhofer IVI Collaboration

Following the Governor-led trade mission to Germany in 2015, and a NSHE Delegation's visit to *Fraunhofer Institute for Transportation and Infrastructure Systems (IVI)*, Dresden in 2017, GOED has since been leading an initiative to build a transatlantic cooperation between Nevada's research institutions and IVI facilitated by an exchange program for researchers between Fraunhofer IVI and UNLV that is envisioned to be the first step towards the creation of a potential *Project Center in Autonomous Synchronized Mobility*.

As part of the newly formed research collaboration, Fraunhofer IVI will send one of its engineers to Las Vegas to establish and expand mobility research projects in Southern Nevada, in collaboration with researchers in UNLV's Transportation Research Center. Together, they will work on Fraunhofer IVI's AutoTruck project, which seeks to equip distribution center trucks with sensors and other

technologies that enable delivery automation. In turn, UNLV will send one of its engineers to Fraunhofer IVI in Dresden, Germany, during the same time period to assist with computer vision—the process by which computers are able to detect or “see” objects in a similar fashion to a human eye—and learn the “Fraunhofer model” of research.

The Fraunhofer Institute for Transportation and Infrastructure Systems IVI employs over 100 researchers in three departments. The institute is operating in a wide array of transport-related research and development topics, ranging from the fields of electromobility, traffic planning and traffic ecology, traffic information, vehicle propulsion and sensor technologies, while also incorporating traffic telematics, the information and communication sectors, as well as disposition and logistics.

Inception: May 2018
Total Funds Awarded (all years): \$500K
Status: Current Project
Project End Date: December 31, 2022



Nevada Center for Advanced Mobility, NCAM

UNLV in collaboration with the Nevada Institute for Autonomous Systems, other NSHE institutions and the Governor's and UNLV's offices of economic development, established the Center for Advanced Mobility (CAM) in early 2016 to serve as a catalyst for bringing together the government sector, industry, and research organizations to address modern transportation issues.

In April 2017, representatives of UNLV and UNR under GOED leadership traveled to Germany to meet with Fraunhofer IVI, Dresden to complete planning and begin the implementation of a researcher exchange program between the Fraunhofer institute and NSHE, specifically to progress transportation research and commercialization initiatives.



Nevada CAM and Nexar announced a strategic partnership to create the first statewide vehicle-to-vehicle (V2V) network in the country. This unprecedented collaboration was designed to enhance safety on Nevada's roads and highways, spur economic development and job creation in the state, and introduce a series of innovative smart transportation systems that will optimize infrastructure management, regional planning and inform policy throughout Nevada.

In late 2016, Nevada CAM conducted a global search for technology solutions to help address pedestrian safety on behalf of the Regional Transportation Commission of Southern Nevada

(RTC). A byproduct of that search was the encounter of technology company WayCare. Under NCAM's guidance, the RTC and WayCare with its predictive analytics platform for smart cities, announced a first of its kind pilot program to help prevent traffic crashes and congestion.

The RTC and WayCare are collaborating with Nevada Highway Patrol (NHP) and Nevada Department of Transportation (NDOT) to utilize WayCare's predictive insights to strategically deploy highway patrol and roadside service units. The technology enables local first responders and traffic management centers to more efficiently deploy resources and to patrol problem areas ultimately hoping in the prevention of traffic incidents.

GOED, the Nevada Department of Transportation, the City of Las Vegas, the Regional Transportation Commission (Team Nevada), and NCAM worked with GENIVI (Jaguar Land Rover, Volvo, Harman, and Hortonworks) in a multi-phased 12-month pilot project that addresses pedestrian safety, increased traffic throughput and reduced traffic congestion across three to four key corridors in Southern Nevada.

Inception: April 2016
Total Funds Awarded (all years): \$210K
Status: Past Project
Project End Date: December 31, 2017
Project Moves to DRI: Fall 2018

Flying Orchestra: A Flying Aerial Robot Live Entertainment System

Total Funds Awarded (all years): \$92K
Status: Past Project
Project End Date: December 31, 2017
NSHE-Industry Unmanned Autonomous Systems (UAS) Collaboration Program

This project comprised an interactive aerial robot instrument concept using unmanned aerial vehicle (UAVs) maneuverability to create a new entertainment experience connecting to audience both visually and acoustically. The project used multiple UAVs to create music as well as audio effects using pre-installed motion tracking system for sense and avoid synchronized assemblies and arrangement. It was integrated into several education programs and curriculums among different colleges to encourage undergraduate

and graduate research and enhance the workforce development of unmanned aerial system (UAS) related economic development.

- Developed a portable Dronetainment system called Flying Orchestra that controls multiple quadcopters as swarm drones.
- The Flying Orchestra is based on non-optical radio sensors that syncs with multiple theatrical units such as DMX lightings, video projectors and audio equipment both indoors and outdoors.

As an outcome of the project, multiple undergraduate and graduate students engaged in drone related research and development activities and further contributed to the enhancement of the UNLV Entertainment of Engineering and Design (EED) program.

- As an extension of the project, the team is working on programming an autonomous drone to participate in the IEEE RSJ ADR competition scheduled this October 2018 Madrid, Spain (selected as one of the 12 teams including MIT and EPFL).



Hybrid Power Source with Energy Harvesting Capability for UAS

Total Funds Awarded (all years): \$75K
Status: Past Project
Project End Date: December 31, 2016
NSHE-Industry Unmanned Autonomous Systems (UAS) Collaboration Program

The research team investigated ways to reduce the temporary high-power demands during a UAS mission, and to reduce the effect of wind load in an effort to increase both the flight time and battery life. The team applied super-capacitors and operated the motors that drive the propellers as generators at times of relatively windy conditions (a concept similar to regenerative braking in electric vehicles). The second piece of the proposed power/energy source was associated with energy harvesting from the power of the wind. The UNLV research project worked to develop a high-performance energy source for UAS that consists of a hybrid super-capacitor and battery bank with a recharging capability from wind power.





Desert Research Institute (DRI)

The Desert Research Institute (DRI) is a recognized world leader in investigating the effects of natural and human-induced environmental change and advancing technologies aimed at assessing a changing planet. For almost 60 years DRI research faculty, students, and staff have applied scientific understanding to support the effective management of natural resources while meeting Nevada's needs for economic diversification and science-based educational opportunities. With more than 400 employees and two main campuses in Reno and Las Vegas, DRI serves as the non-profit environmental research arm of NSHE.

Knowledge Fund Projects at DRI

Applied Innovation Center, AIC

Inception: March 2014

Total Funds Awarded (all years): \$6M

Status: Current Project

Project End Date: June 30, 2019

The AIC leverages the intellectual capital of DRI faculty and 60 years of environmental science research in four main areas of applied research: climate, weather, and energy nexus; Internet of Things (IoT) and remote sensing; engineering and design; and life sciences and informatics.

From these four core areas, the AIC builds hardware and software for industry, leverages these platforms for sponsored projects, creates jobs, and helps build innovative companies in Nevada.

The Healthy Nevada Project, AIC

Developed by the Renown Institute for Health Innovation (Renown IHI), this is one of the first community-based population health studies in the nation. A world-class team of researchers and physicians from DRI and the Renown Health healthcare network are working together to use genetics, environmental data, and individual health information to create a healthier Nevada.

PHASE ONE: Open to northern Nevada residents, the comprehensive pilot phase of the study offered community members the opportunity to volunteer for research and gain access to their individual genetic information free of charge on September 15, 2016.

- The pilot phase of the study enrolled 10,000 participants in less than 48 hours.
- Subsequent DNA sample collection from each participant was completed in just 60 working days.
- DNA genotyping was done with personal genetics company 23andMe.
- Participants in the pilot phase of the study range from ages 18 to 90 years old and come from 135 zip codes in northern Nevada.

PHASE TWO: For the second phase of this project, research teams will have greater depth and quality of DNA data thanks to a public-private partnership with Helix, a personal genomics company that uses Next Generation Sequencing (NGS) technology and operates one of the world's largest, most highly accredited exome sequencing labs.

Utilizing Helix's proprietary NGS technology and uniquely personalized suite of DNA-powered products, research teams are offering an additional 40,000 Nevadans the opportunity to have their DNA sequenced and participate in the next phase of the study which opened for enrollment on March 15th, 2018.

In Phase Two, Renown IHI will begin providing advanced calcium score screenings to pilot phase participants at higher risk for cardiovascular disease. This will allow researchers to examine the link between genetics and calcium buildup in the heart. Additionally, based on pilot phase data, researchers have seen increased use of regional healthcare correlated with fluctuations in air quality and so-called "bad air events" such as wildfires and atmospheric inversions. Renown IHI will also evaluate possible links between genetics and increased susceptibility to respiratory ailments.

In the years ahead, Renown IHI aspires to offer genetic testing through the Healthy Nevada Project to every Nevadan interested in learning more about their health and genetic profile and drive positive health outcomes statewide. Simultaneously, the Healthy Nevada Project will expand the state's access to cutting-edge clinical trials and foster new connections with biotechnology and pharmaceutical companies.

"Nevada is leading the country in growth and innovation. But sadly, we continue to rank among the worst regarding health at 47th in the nation. Through the Healthy Nevada Project, we now have the gift of insight to make needed changes not just for ourselves and our loved ones but for Nevada."

**Nevada Governor
Brian Sandoval,**

The Healthy Nevada
Project's first participant





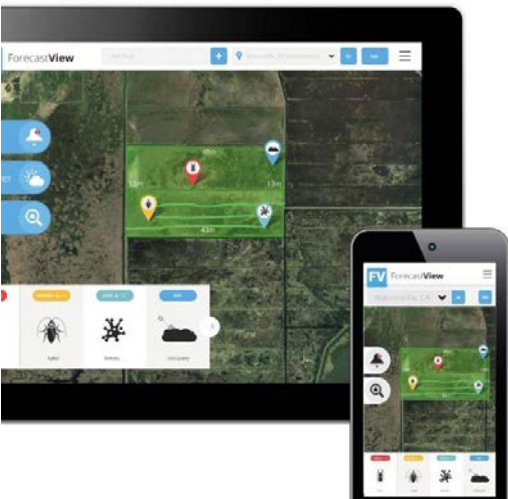
Venture-Capital Funding Raised for Tu Biomixs, AIC

Tu Biomixs Inc., born from DRI's expertise in microbial ecology, is an agricultural pharmaceutical company that targets industrial scale farming and its significant soil health challenges. In conjunction with DRI's soil and molecular biology scientists, Tu Biomixs is driving the development of organic antifungal chemicals as a cost-effective alternative to currently available options. DRI scientists have demonstrated the ability of Biological Control Agents (BCAs) to eliminate white rot, a fungal pathogen impacting onion and garlic crops, under laboratory conditions.



First AIC, Desert Research Corporation Spin-Out Company Launches

Predira Inc. leverages DRI's weather intelligence platform to provide localized pest and disease forecasts for industrial scale farming through a web-based software product called ForecastView. With its companion smartphone app, FieldScout, users can input real-time data and get timely, detailed pest and disease forecasts as well as response options to mitigate significant crop loss. DRI scientists are completing software development and beta testing of ForecastView and FieldScout with some of California's largest berry growers.



WaterStart (formerly the Nevada Center of Excellence in Water):

As fresh water becomes increasingly scarce, water resource management and sustainability will be vital to maintaining quality of life and economic development in communities around the world.

WaterStart is a cluster of global leaders in the implementation of water technology. Formed in 2013, WaterStart was established through a joint venture between academic, public, and private sectors to create a statewide network to deploy and test compelling, early-stage technologies that address Nevada's greatest water management challenges. This network now includes, Nevada's two largest drinking water utilities that serve approximately 80% of the state's population, the largest agricultural producer, the largest employer and commercial space operator and has recently expanded to include out-of-state, as well as international drinking water utilities.

This group has collectively provided support through WaterStart's membership program by contributing \$400,000 to support technology recruitment and project development activities, opening up their facilities and infrastructure to host pilot projects, and providing more than \$800,000 in additional funding to support these pilots.

Nevada and Queensland, Australia recently signed a sister state agreement, which includes \$500,000 in funding for Queensland innovators to collaborate with WaterStart to improve local urban water supply systems and take their ideas to Nevada and the world. This agreement makes WaterStart truly international.



Its network of early adopters has effectively created a unique process for prioritizing, implementing, and evaluating new water technologies. This process, which is the foundation of WaterStart's Commercialization Program, has rapidly accelerated the rate of technology deployment and provides a critical pathway for new technologies to successfully enter the U.S. water market. WaterStart and its members have:

- Developed a list of more than 60 innovation priorities.
- Assessed more than 300 technologies based on member needs.
- Evaluated more than 220 proposals from companies seeking to participate in the Commercialization Program.
- Implemented 17 projects.
- Funded nearly \$1.5M to deploy and test new water technologies.

Inception: April 2014
Total Funds Awarded (all years): \$3.7M
Status: Current Project
Project End Date: June 30, 2019

Partnership for Research to Open Markets for an Emerging Technology: Helping to Expand Unmanned Systems (PROMETHEUS)

Total Funds Awarded (all years): \$491K
Status: Current Project
Project End Date: June 30, 2019
NSHE-Industry Unmanned Autonomous Systems (UAS) Collaboration Program



This project's purposes include developing new technologies and applications as they relate to fire science research and fire management; assessing the commercial potential of fire-UAS applications and assisting Nevada companies in targeting relevant markets; building capacity and conducting outreach to promote fire-related UAS business for our Nevada partners in the field of fire science and fire management; and seeking opportunities to conduct demonstrations, operations, and relevant supporting research.

Consulted with three Reno-based UAS startups on strategy and market.

Planning (Phase I) for the largest fire research project in history, Fire and Smoke Model Evaluation Experiment (FASMEE).

Supported or submitted external funding proposals for more than \$25 million.

Development of specialized UAS payloads for air-quality monitoring and measurements for fire-smoke impacts and public health applications.

Known returns to industry partners and Nevada represent more than \$10 for each dollar invested in this project by GOED.

Cloud Seeding

Inception: November 2015
Total Funds Awarded (all years): \$750K
Status: Past Project
End Date: June 30, 2018

DRI, in partnership with AviSight and Drone America, developed and tested UAS technologies for cloud seeding operations. This includes creating forecasts and conducting flight planning for manned and unmanned aircraft, cloud seeding using manned and unmanned systems and ground generators as well as estimating effectiveness of UAS cloud seeding operations.

The goals of the project were four-fold:

1. Development of new UAS technologies for cloud seeding operations while demonstrating Nevada's Public COA and commercial COA and 333 authority.
2. Operation of UAS for cloud-seeding operations, both alone and in conjunction with ground-based generators and manned aircraft.
3. Assessment of the effectiveness of unmanned cloud seeding platforms using newly-developed technology and tools.
4. Assessment of the broader market potential and development of a commercialization process for UAS cloud seeding in other areas.

Highlights

Longest commercial UAS flight in US airspace, and DRI's first beyond-line-of-sight (BLOS) flight.

More than two dozen print-media and web stories by local, state, national and international media, including a feature article in Popular Science.

Letter of collaboration to pursue cloud-seeding work in UAE with industry partners.



Unmanned Aircraft System (UAS) for Agricultural Applications - Winnemucca Farms (AA/WF):

Inception: April 2016
Total Funds Awarded (all years): \$152K
Status: Past Project
Project End Date: December 31, 2017

DRI, in collaboration with AboveNV, deployed AboveNV's Unmanned Aircraft Systems (UAS) in support of agricultural and water management of critical crop fields owned and managed by Winnemucca Farms, Inc. The project tested the applicability of UAS data to address large-scale, multi-crop agricultural needs, particularly water-related crop stress and irrigation efficiencies.

Winnemucca Farms, Inc. is one of the largest in Nevada and expressed interest in assessing UAS data products to improve farm management. UAS activities were conducted using AboveNV's Section 333 Certificates of Waiver or Authorization (COA) and the team worked with the Nevada Institute for Autonomous Systems (NIAS) to become a NIAS Node that allowed use of the NIAS blanket COA from the FAA.

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DRI and AboveNV proposed a near-term and long-term approach to utilizing UAS collected imagery to monitor irrigation management and crop health. The project focused on UAS data acquisition to identify and map agricultural crop stress that will lead to improved water use while maintaining and/or improving crop yields (project location is a portion of Winnemucca Farms' properties). Highlights included:

- Image processing methods were further defined and UAS imagery of fields in bare soiled condition acquired. This enabled the assessment quality of elevation mapping from standard image processing techniques.
- In response to the client's needs, the original intent of developing a Geographic Information System (GIS) database was changed to pursue a secure web-based interface that the farm manager and his staff will be able to use from a computer or handheld devices such as notebook and smart phone assisting in his crop management decisions. This exemplifies customer driven applied R&D solutions.
- Collaboration with a DRI faculty member, which resulted in the preparation of a secured website to display data acquired for Winnemucca Farms at multiple spatial scales. It includes both USGS digital elevation model data and a Landsat 8 satellite multispectral 13 image that encompasses the entire main farm fields and immediate adjacent areas with the UAS-acquired images being embedded.
- DRI personal provided training to local start-up AboveGeo on the calibration and operation of FLIR thermal cameras and how to establish ground-based calibration targets for acquisition of thermal images using UAS. This is a good example of how an applied research institution can support a local early stage company by providing vital technology and equipment know-how.