



**B**ruce Golden had an idea. The long-time professor of animal genetics and breeding at Colorado State University in Fort Collins was often recognized for his innovative research, but what he calls “an interesting bit of kismet” turned an inkling in the back of his mind into something that would be utilized worldwide.

Years ago, a flood on campus resulted in different departments sharing undamaged office space, and Golden found himself talking biometrics with the philosophy professor next door. More conversations followed and eventually included a professor from the business department.

Soon their collaboration transformed into a patent, and then a multimillion-dollar business just one mile from the campus where it all began.

Golden’s concept is now Optibrand Ltd. LLC, the originator of the only retinal scanning system for livestock. The device, called OptiReader, is a handheld computer and digital camera that electronically “reads” an animal’s eye for future identification, like human fingerprinting. The scan is combined with information, such as what the animal has eaten and its transport history, to create a database for tracking and source verification.

“We’d all sit there and wonder why doesn’t some company take this patent and make something of it,” Golden says, adding that was when the three professors decided to



# DEGREES OF INNOVATION

UNIVERSITIES PROMPT HIGH LEVELS OF DEVELOPMENT EVEN IN NON-URBAN AREAS

THE OPTIREADER is a handheld retinal scanning system for livestock identification. The invention, and its parent company, was born from research conducted at Colorado State University. The device is now used worldwide for animal tracking and verification.



PHOTO BY JOSHUA LAWTON

(FROM LEFT) BRUCE GOLDEN, RALPH SWITZER AND BERNARD ROLLIN founded Optibrand after collaboration and research as professors at Colorado State University. Their company is based in Fort Collins, Colo., just a mile from campus.

take one step farther and form a business. “I’d always been a little entrepreneurial.”

Today, the OptiReader is used around the globe, including to combat the spread of disease and to prove authenticity in livestock competitions.

Golden can’t think of any other place where the OptiReader could have developed. The small city of about 127,000 in northern Colorado can’t offer the high concentration of people and resources like large metropolitan areas, such as Denver just 70 miles south.

But, Fort Collins is home to CSU and its 25,000 students, 1,400 faculty members and \$220 million in annual research funding.

“It’s not only the big cities that are innovative,” says Michael Orlando, an economist and the Denver Branch executive of the Federal Reserve Bank of Kansas City. “Rates of innovation are strongly tied to university presence, including those located in small cities and rural areas.”

Orlando recently researched the relationship between universities, population and regional innovation in the Tenth Federal Reserve District along with Stephan Weiler, formerly an economist and assistant vice president with the Bank, and Michael Verba, a research associate.

The District includes western Missouri, Kansas, Nebraska, Oklahoma, Wyoming, Colorado and northern New Mexico—all states with rural, yet innovative universities.

### **Campuses and communities**

Innovative activity is typically correlated with population—the higher the population, the higher the rate of innovation. This is a result of characteristics of highly populated areas that enhance innovation. These attributes, such as availability of specialized goods and services, well-developed transportation and infrastructure, and opportunities for learning through knowledge spillovers, are also

common near institutions of higher learning.

“In comparison to areas of similar size,” Orlando says, “areas with universities have a high number of educated workers, thick markets for the goods and services used by such workers, and a strong communications infrastructure. In a way, universities may substitute for greater population.”

Nationwide, universities play a large role in innovation, conducting about 14 percent of the country’s research and development, according to the National Science Foundation. A significant jump in county patent productivity occurs with the presence of at least one university, Orlando says.

Without controlling for the effect of population, areas with universities produce 73 percent more patents per capita than areas without universities. This suggests universities may affect knowledge creation in ways beyond bringing together large numbers of people, Orlando says.

In the most heavily populated areas, with a population larger than 1 million, university counties are 20 percent more patent-productive than non-university counties.

This university advantage is even greater in less-populated areas where places with at least one university produce 41 percent more patents per capita than similar-sized areas without universities.

As a result, in the vicinity of a university, innovation may be disproportionately high compared to that area’s population, like Fort Collins. But it’s no surprise the revolutionary OptiReader and its parent company were born there.

“The presence of universities, much like an area’s population, is an important factor related to the level of regional innovative activity,” Orlando says.

## Higher education, innovation

Although university counties typically have a higher patent per capita ratio than non-university counties, the relationship between university presence and county innovation appears to vary with the level of degrees offered.

Counties with doctorate-degree-granting universities have some of the highest rates of

innovation regardless of whether they are located in a high- or low-populated area. In sparsely populated counties with less than 200,000 people, the average annual rate of innovation is 112 percent higher than in similar-sized counties hosting only a bachelor-degree-granting institution.

A similar relationship can be observed in more populous counties where doctorate-degree-granting universities are 94 percent more patent-productive than bachelor-degree-granting universities.

Overall, the average patent per capita rate of counties where doctorate degrees are offered

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**TIFFANY WEIR**, a student at Colorado State University, is researching plant disease. Areas surrounding a university are highly innovative, even if they are rural or sparsely populated.

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**UNIVERSITY STUDENTS** make up nearly a quarter of Fort Collins' 127,000 residents.

is 229 percent higher than non-university counties. Areas where the highest degree offered is a bachelor's degree have only a slightly higher (26 percent) patent productivity rate than non-university counties.

Even so, this minor rate increase can mean big innovation, such as in the small, northeastern Oklahoma city of Claremore, home to Rogers State University and its student body of about 3,000.

RSU was a community college until 2000 when it became an accredited university, now offering both associate's and bachelor's degrees. The university also recently opened its Innovation Center—something not typically found at small universities, says Ray Brown, the center's director and RSU vice president for economic and community development.

**“The presence of universities, much like an area's population, is an important factor related to the level of regional innovative activity.”**

What Brown describes as a “technology incubator,” the center is a 7,000-square-foot facility on the RSU campus that houses business and technology training offices as well as research labs. Its primary goal is to provide services and resources that will result in financially viable entities in the community.

Most remarkable, Brown says, is the effect RSU and the center have on innovation in the city of just 17,000 or so. A recent survey conducted by RSU shows the university had a roughly \$40.5 million impact statewide in 2004, which includes both direct expenditures by the university and the indirect impacts of researchers and students who live in the state.

“There's a lot of research going on,” he says. “We certainly are trying to be innovative. ... I'm not saying we're going to rival Silicon Valley or anything like that, but we think there is a lot of potential (at RSU).”

### **Strength in numbers**

“The impact of a university at any level of degree offering is related to the size of the population where it's located,” Orlando says. “Overall, highly populated urban areas with doctorate-degree universities tend to be the most innovative.”

This appears to be the case in Albuquerque. The northern New Mexico city of more than 700,000 is home to the University of New Mexico and the Sandia National Laboratories, and is in close proximity to the Los Alamos National Laboratory.

Both labs work for the U.S. Department of Energy, primarily conducting nuclear defense research. Both also have “a pretty tight relationship” with the university, says Sul Kassicieh, associate dean for research and economic development, and chair in economic development at UNM.

The university has a student population of more than 26,000, plus branch campuses, and offers degrees through the doctorate level. The university also houses research units including the High Performance Computing Center, Cancer Center, New Mexico Engineering Research Institute and Center for High Technology Materials.

UNM’s varying research as well as partnerships with premier national security labs result in a highly innovative, patent-rich area, Kassicieh says, benefiting both the university and beyond through the exchange of ideas, research and funding. This attracts new ideas and perpetuates more innovation.

“It’s a circular effect,” Kassicieh says.

## Benefits

More than the university where for 19 years he conducted research and developed ideas, Colorado State University enabled Bruce Golden to form partnerships with fellow professors who would become co-founders of Optibrand, and also recent graduates who make up much of his 15-person staff.

Optibrand is one of many ideas sparked within the university that has grown into a community presence, says Hunt Lambert, associate vice president of economic development at CSU.

“We’re full of innovative people,” Lambert says. “A number of their ideas become companies.”

CSU’s research ranges from infectious diseases to clean energy. Companies, like Optibrand, born at the university range from a charitable organization to a road bike store.

“We have smart people with good ideas and the infrastructure to start businesses,” Lambert says, adding that a dozen or so area companies were started in the last five years by alumni.

CSU innovation has a “dramatic impact”

on the community, Lambert says. But without the community, it’s likely the innovation would be taken elsewhere, he acknowledges.



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**CAMELIA STAN** works in the Center for Rhizosphere Biology at Colorado State University. Research at universities is critical to an area’s level of innovation.

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The rich environment of Fort Collins draws research and innovation to CSU. And the university’s innovation in turn feeds that environment, Lambert says.

Such was true for Optibrand.

“It takes that kind of blending,” Golden says. “That university stage is real critical.”

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**BY BRYE STEEVES, SENIOR WRITER**

## FURTHER RESOURCES

**UNIVERSITIES, POPULATION AND REGIONAL INNOVATION**, BY MICHAEL J. ORLANDO, STEPHAN WEILER AND MICHAEL VERBA

[www.KansasCityFed.org/TEN](http://www.KansasCityFed.org/TEN)

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