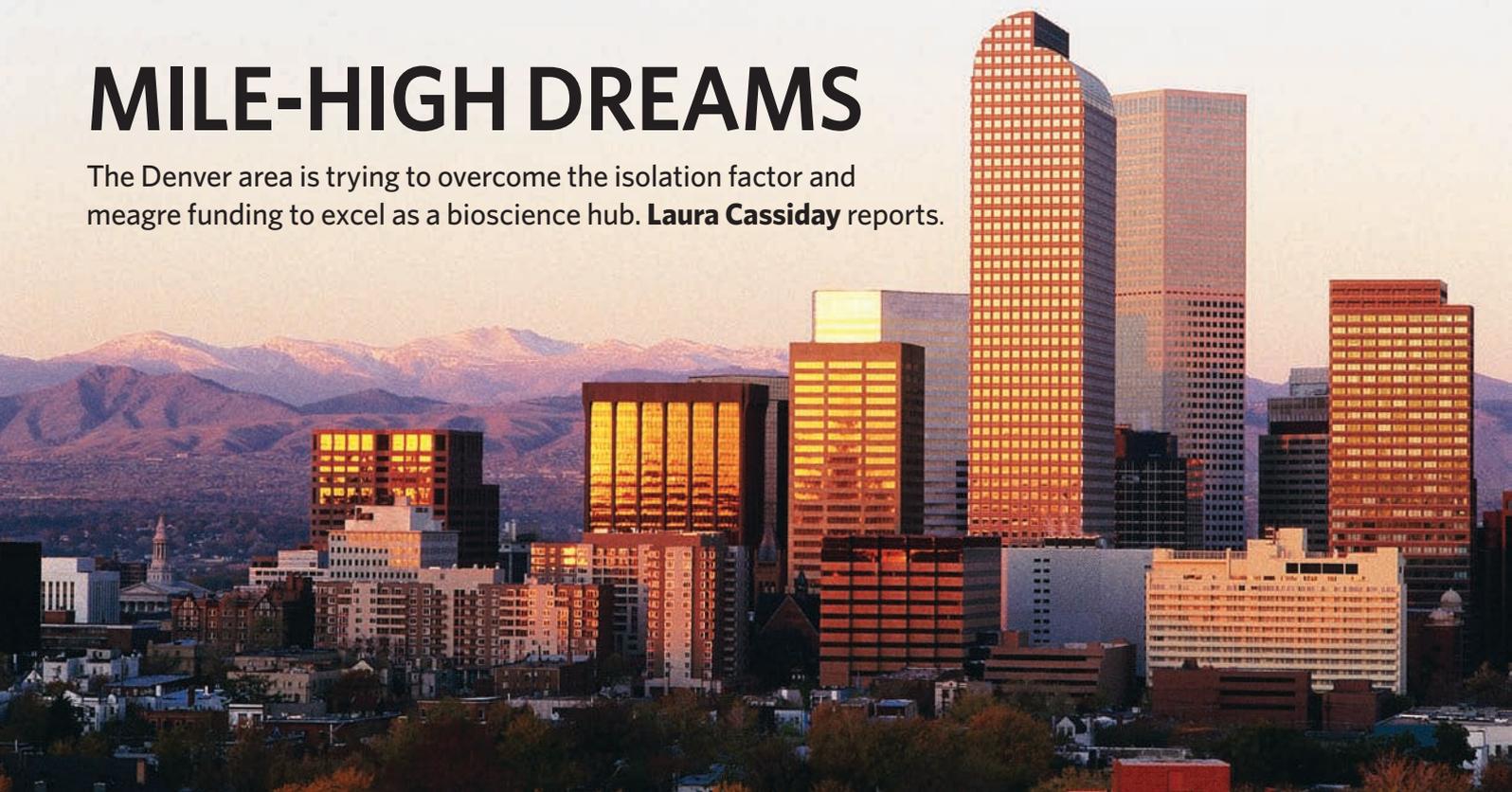


MILE-HIGH DREAMS

The Denver area is trying to overcome the isolation factor and meagre funding to excel as a bioscience hub. **Laura Cassidy** reports.



On a clear day, researcher Yosef Refaeli can see the distant, white-capped Rocky Mountains from his office window in Aurora, Colorado. Those scenic peaks, he says, were one of the main reasons he came to the Denver area, and to the new Anschutz Medical Campus at the University of Colorado Denver. Another was the adjacent fledgling biotech park.

The recently opened and still-expanding Anschutz campus is one of several attempts to invigorate Denver's life-science enterprise. Located on the site of the former Fitzsimons army hospital base, the campus is divided into clinical, research and education zones, with 470 PhD students and another 300 working towards master's degrees in fields such as immunology, pharmacology and neuroscience. First opened in 2004, its 92 hectares dwarf its previous 18-hectare space in downtown Denver.

Refaeli, an assistant professor of dermatology and immunology, has had some preliminary success converting his research on blood stem cells into treatments for autoimmune diseases and improved means to donate blood. He has co-founded the company Taiga Biotechnologies, located in the biotech incubator building. But venture capital has been hard to come by. And although the incubator has spawned some successful biotech ventures, the rate of growth has been much slower than originally planned. Efforts to convert the nearby golf course into a biotech park are behind schedule.

In general, attempts to make Denver a bioscience hub have met with mixed success,

especially owing to the recent economic downturn. "Because we have only a handful of venture capitalists in Colorado, most of our companies have to go out of state to raise capital," says Denise Brown, interim executive director of the Colorado BioScience Association. "And that's a little hard, because investors like to be geographically close to their companies." Denver's geographical isolation from big population centres on the nation's coastlines can be a hindrance. "What we lack is critical mass, which is enjoyed by the tier-one sectors," says Brown, referring to places such as San Diego and Boston.

What Denver lacks in capital, it makes up for in innovation and entrepreneurial spirit, say some resident scientists. Bioscience company creation and employment growth in the past five years exceeded the national average, according to statistics compiled by the Metro Denver Economic Development Corporation. And the public universities are doing a good job of fostering innovation. According to Brown, of the 20–25 new companies every year in Colorado, 75% are formed to develop university-based technologies. Colorado's 400 bioscience companies employ approximately 18,000 people statewide.

The Denver area also boasts two large public universities, Colorado State University (CSU) in Fort Collins and the University of Colorado at Boulder (CU-Boulder), along with the renowned National Jewish Health hospital in downtown Denver. Karolin Luger, biochemist and molecular biologist at CSU and an internationally known X-ray crystallographer, received several faculty position offers of more money and prestige than CSU, which she

joined in 1999. But Luger was impressed with the collegial atmosphere and scientific vision of the department — and those mountains reminded her of the Austrian Alps where she grew up.

Still, state funding for higher education is tight. In fiscal year 2009, Colorado ranked 47th among the 50 states in terms of spending per full-time student. Two clashing amendments to the Colorado Constitution prohibit tax increases that outpace inflation, but mandate annual funding increases for K-12 (from kindergarten to twelfth grade) education. Higher education usually bears the brunt of budget cuts, which in the past has resulted in faculty-member lay-offs, statewide hiring freezes and soaring tuition fees.

An entrepreneurial approach

Among university researchers, opinions are divided on the effects of little state money, because laboratories are typically funded by federal grants. John Freed, Anschutz's graduate school dean, notes that poor state funding and the recent recession have forced many researchers to adopt an entrepreneurial approach, seeking funds from other non-state and non-federal sources such as private foundations and industry partnerships. As a Howard Hughes Medical Institute investigator, Luger doesn't lack lab funding. But she does notice the shortfall at the university level, in effects ranging from a recent faculty hiring freeze to less frequent emptying of rubbish bins. "Class sizes and tuition have increased, which affect the quality of our students," she says. "The faculty hasn't seen pay rises in years, and some very bright

people are being poached by other places.” A paucity of university funding has an effect on the area’s biotech and technology-transfer potential, says Jill Farnham, executive director of the Fitzsimons Redevelopment Authority, which is overseeing efforts to build the biotech park near the Anschutz campus. “It definitely poses a future challenge if we don’t remedy that situation,” she says.

Despite the bleak state funding, new bioscience initiatives and building projects, funded mainly by private sources, have persevered. This July, researchers will begin to occupy the newly completed CSU Research Innovation Center, a 6,700-square-metre US\$52-million facility on the university’s Foothills Campus. The building, funded by university-issued bonds, includes lab space for faculty researchers who study infectious diseases, as well as a biosciences incubator for fledgling CSU start-up companies and other businesses. Joe Guiles, chief operating officer of MicroRx, a division of CSU Ventures, says that the new centre aims to stimulate public-private partnerships in bioscience.

Multidisciplinary innovation

Ralph Smith, associate director of the Infectious Disease Research Center at the Foothills Campus, anticipates that the building’s construction will result in at least 50 new positions over the next three years, including faculty members, postdocs, graduate students and technicians. “We want to hire scientists who bring something to the collaborative table that enlarges the skill set we have,” says Smith. “We’re also interested in faculty who want to apply their research to developing new products.” Guiles foresees a multidisciplinary team of researchers, including veterinary scientists, microbiologists, medicinal chemists, and genomics and proteomics researchers, who will work collaboratively to achieve medical breakthroughs.

Guiles estimates that more jobs — between 30 and 45 by the end of the year — will arise

from start-up companies leasing space in the building. Several companies have committed to lab space, including the CSU start-up companies Prieto Battery and Advanced MicroLabs. The Research Innovation Center also includes a small manufacturing facility that can be leased by companies to produce biological agents such as monoclonal antibodies and vaccines. “Under one roof, we have enterprises that can invent life-saving vaccines and also manufacture them so they can be tested in humans,” says Guiles.

CU-Boulder also has plans to stimulate the creation of bioscience companies. In 2003, the university launched the \$350-million Colorado Initiative in Molecular Biotechnology (CIMB) — an interdisciplinary programme that unites researchers from diverse fields to develop new diagnostic and therapeutic agents. Of that, \$170 million (from university funds, philanthropy and grants) is supporting the construction of a 24,000-square-metre biotechnology building on the university’s East Campus, set for completion in November 2011. Brown, also an assistant director of the CIMB, says that the university has already hired eight faculty members to occupy the building, with 12 positions yet to be filled. When fully occupied, the building will house approximately 60 principal investigators and their personnel.

CU-Boulder faculty members and students have already had some success founding companies. Examples include Myogen, which developed drugs to treat cardiovascular disease before being acquired by Gilead Sciences in 2006 for \$2.5 billion, and Dharmacon, a provider of RNA oligonucleotides that was acquired by Thermo Fisher Scientific in 2004 for \$80 million. According to David Allen,

associate vice-president for technology transfer at CU-Boulder, seven or eight biomedical-science-related companies spin off from CU-Boulder every year. For Kelly Sullivan, a researcher in the molecular, cellular and developmental biology

department at CU-Boulder, the close relationship between CU-Boulder and the biotechnology sector made the school a more attractive postdoc destination. “It’s kind of unique and good for people who don’t know exactly what their next step is,” he says.

The Denver area hosts large manufacturing centres for biotech company Amgen and drug-maker Roche, but most biopharma companies are fairly small (from 2 to 150 employees) and are engaged in research and development, with no approved products. “Where Colorado excels is in new technology development,” says Brown. “The successful companies get up to 200 employees and are around

for 10 years or so, and then they typically go through merger and acquisition.” Often at that stage, companies move out of the state.

Refaeli has noticed similar patterns at the Anschutz campus; Denver companies who are lucky enough to secure major venture capital end up moving to places such as San Francisco. So far, Taiga Biotechnologies has secured funding up to 2011. But Refaeli does laud a state-sponsored tax credit that has already benefited the company. Local investors who support biotech with at least \$25,000 receive a 15% credit in the form of tax breaks. Colorado also has a ‘Bioscience Discover Evaluation Grant Program’ that awards up to \$250,000 to companies whose technology is licensed from a qualified Colorado research institution.

The Denver area, and those mountains, often coax people into staying. Mergers and acquisitions don’t always translate into a loss of the state’s scientific workforce, says Allen. “There’s a lot of birth and a lot of death of companies, but the talent typically stays here — people don’t want to leave,” he says. Colorado companies getting acquired and moving away isn’t necessarily a bad thing, says Brown. “Once they are sold, a lot of wealth is created in the community, and the executives and founders of the companies tend to stay in the state and start other companies,” she says. Brown and others hope that as Colorado’s reputation as a start-up cluster continues to grow, the scenery won’t be the only thing that lures scientists, entrepreneurs and investors to the area. ■

Laura Cassidy is a freelance writer based in Hudson, Colorado.

Additional reporting by Gene Russo, editor of Naturejobs.



“The faculty hasn’t seen pay rises in years, and some very bright people are being poached by other places.”
— Karolin Luger

W.A. COTTON/CSU



The state-of-the-art Anschutz Medical Campus in Aurora aims to promote collaboration and innovation.

UNIV. COLORADO DENVER