

# FROM STEEL TO SCIENCE

Pittsburgh's universities are helping the city to emerge from its Rust Belt roots and forge a knowledge economy. **Paul Smaglik** reports.

**W**hen US President Barack Obama picked Pittsburgh, Pennsylvania, to host the 2009 G20 summit, state governor Edward Rendell joked that world economic leaders would expect smog and shuttered steel mills. Instead, what they saw last September was a clean city with brownfield sites reclaimed by life-science and high-tech incubators, and university campuses surrounded by satellites of businesses such as Google and the RAND Corporation.

Pittsburgh has become an economic bright spot in a sea of once-vibrant, now depressed US manufacturing cities. Unemployment is at 8%, compared with the national rate of 10%. And many of the city's jobs are in the expanding fields of life sciences, computer science and energy. Last year, *Forbes* magazine ranked Pittsburgh sixth among US cities for job growth, with most of an anticipated 30,000 new jobs coming in health care and energy.

Rendell describes Obama's G20 decision as "a vote of confidence that Pittsburgh had transformed itself from the old economy to the new economy". The old economy depended on coal and steel. The new one relies on talent — recruiting, retaining and developing it. The neighbouring campuses of the University of Pittsburgh and Carnegie Mellon University are major drivers of that change. Both have created research niches for themselves that have allowed them to climb the ranks in research funding and prestige.

The University of Pittsburgh became one of the top ten individual institutions funded by the US National Institutes of Health (NIH) in 1997 and rose to fifth in that listing in 2008, with \$447 million in funding compared with \$186.8 million in 1999. The university's total research funding has almost

tripled in 15 years, from \$230 million in 1994 to \$650 million in 2009. Carnegie Mellon achieved sixth place for technology research and education in global university rankings by the *Times Higher Education Supplement*.

Both universities have also capitalized on a wave of new grants pegged to the 2009 American Recovery and Reinvestment Act. The University of Pittsburgh has received 254 awards representing \$124.2 million of new or continued funding. Along with Carnegie Mellon, it will be one of the major players in a five-year, \$465-million search by the National Energy Technology Laboratory (NETL) for cleaner power sources.

Margaret McDonald, associate vice-chancellor for academic affairs at the University of Pittsburgh Schools of the Health Sciences, says that both the university and Pittsburgh as a whole are slowly winning a long-term recruitment battle. The six schools in the health-sciences department currently employ more than 500 researchers. The University of Pittsburgh Medical Center, with 50,000 workers, is the city's largest employer — but it isn't always easy to woo staff.

"Our reputation hasn't caught up with our ranking," McDonald says. "People still see a city that was grounded in a heavy industrial economy. But that was gone almost three decades ago." She cites the city's under-appreciated neighbourhoods, cultural amenities and low cost of living as selling

points for potential scientists. Victorian homes within walking distance of campus go for around \$150,000.

The health-sciences schools have tried to increase their attractiveness to recruits, from postdocs to principal investigators, says Joan Lakoski, associate vice-chancellor for academic career development. She has added courses in postdoc survival skills

and research ethics to the university's training repertoire, and offers workshops in grant writing and lab management. "Providing a better stage for career development is making us more competitive in recruiting," Lakoski says.



**"Our reputation hasn't caught up with our ranking." — Margaret McDonald**

## Pittsburgh calling

New facilities have also helped to attract talent. When Cecilia Lo left the National Heart, Lung and Blood Institute last August to become the founding chair of the University of Pittsburgh's department of developmental biology, a new zebrafish facility had helped tip the balance in her decision. At the NIH, she

says, a lack of animals had prevented her from finishing a large genotyping project.

"Having a core facility means you can focus on research, rather than on a lot of housekeeping," Lo says. And having a hospital next door will help her link basic science with clinical applications. That will be especially helpful to Lo's leading role in the NIH's \$100-million 'bench to bassinets' network. Along with other researchers — at the University of Utah, Harvard University



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and the University of California, San Francisco — Lo will investigate how the cardiovascular system forms in the fetus, seek ways to screen and diagnose defects, and develop treatments. She anticipates hiring two or three principal investigators, two dozen postdocs and technicians, and a handful of graduate students, just for the department of developmental biology.

Meanwhile, Naftali Kaminski, an expert in asthma at the University of Pittsburgh, earned stimulus funds that should allow him to recruit for nine positions ranging from postdocs to computer programmers. When Kaminski arrived at the university's pulmonary-research division in 2002, it received little external funding. Now it is one of the top pulmonary-research programmes in the country, receiving \$16 million in NIH resources last year. Since last autumn,

Kaminski has also secured three stimulus grants worth a total of \$15 million to study the genomics of advanced lung diseases such as pulmonary fibrosis. The university's extensive network of hospitals, one of the country's largest, allows Kaminski and his colleagues to search for biomarkers to aid in the treatment and management of these lung diseases.

### Competitive advantage

At Carnegie Mellon, a legacy of robotics and computational prowess has contributed to a new-found focus on cybersecurity and energy research. Pradeep Khosla, dean of the university's engineering department, talks of seeking "competitive advantage" by capitalizing on existing strengths to build programmes. In the 1970s, Carnegie Mellon began specializing in robotics. As head of its computer-engineering department in 2000, Khosla thought about that history. "I was looking for growth opportunities," he says.

Noting the paucity of faculty members working on computer security, he started expanding Carnegie Mellon's programme. After the terrorist attacks of 11 September 2001, cybersecurity became a crucial point for national defence. Now Carnegie Mellon's CyLab has 50 faculty members, 100 students and 30 academic staff — the largest such institution in the United States. The programme receives funding from the Department of Defense, the Department of Homeland Security and the National Science Foundation. Carnegie Mellon is also using its expertise in cybersecurity to gain more stimulus funding, which will allow it to recruit more faculty members, says Khosla.

Earlier investments have also allowed Carnegie Mellon to take advantage of new funding opportunities in energy. Jay Whitacre is one beneficiary. An assistant professor of materials science and engineering, and of engineering and public policy, he received \$5 million in stimulus

funding from the Department of Energy last autumn to develop energy-storage technologies that will help to bring renewable sources to the grid. Whitacre secured the grant in part because Carnegie Mellon had started investing in energy research about five years ago, says Khosla. And in 2008, Andy Gellman, head of the university's chemical-engineering department, secured a \$26-million energy-department grant to develop cleaner ways to use fossil fuels.

These grants helped to pave the way to a bigger funding coup: the NETL contract. Carnegie Mellon, the University of Pittsburgh and three other institutions involved will study, for example, ways to burn coal more cleanly, to develop storage for power generated by wind and to improve energy-grid efficiency. There are around 150 faculty members and postdocs working on the research projects at Carnegie Mellon, The University of Pittsburgh and West Virginia University in Morgantown. "We probably have every imaginable skill set represented," Gellman says. The lab's academic collaborations, and eventual corporate partners, should spawn new companies in the area, he adds (see 'Greenhouse on a brownfield').

After some initial trepidation about moving from the Bay Area in San Francisco, Greg Lowry, a professor of civil and environmental engineering at Carnegie Mellon, has become a Pittsburgh believer. Beyond housing that costs a fraction of San Francisco prices, Lowry, a nanotechnology specialist working on bioremediation, has found that the close relationship between the University of Pittsburgh and Carnegie Mellon makes forming research collaborations easier. "If you come here and work hard, you can be a full professor in eight years," says Lowry. These days the old steel town is forging a new product: science. ■

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## GREENHOUSE ON A BROWNFIELD

Although it is not a biotechnology hub, Pittsburgh is aiming to use state funds to capitalize on local science strengths. The Pittsburgh Life Sciences Greenhouse (pictured), which provides venture capital, incubator space and management expertise to local biotech companies, was seeded with \$33 million in tobacco-settlement funds and \$70 million from local foundation contributions on the site of a former steel company. The greenhouse is a public-private partnership funded by the Commonwealth of Pennsylvania, the University of Pittsburgh, Carnegie Mellon University, the University of



Pittsburgh Medical Center and Pittsburgh's regional foundation community.

Since its inception in 2001, the greenhouse has nurtured 27 early-stage companies, venture-capital firms and life-sciences organizations by providing office

and laboratory space in its 2,000-square-metre incubator. It has raised almost \$500 million in venture-capital funds for 50 companies, produced 5,000 jobs and transplanted four executives to local life-science company

leadership positions.

Chief executive John Manzetti says the greenhouse's 'executive in residence' programme provides, in effect, "a two-year paid job search" for its participants, because managers run portfolios of 10 or so local companies — experience that

often leads to full-time work once their two-year stints end.

The greenhouse lured the small Alzheimer's disease therapeutic company Cognition Therapeutics from San Francisco to its incubator space in 2007 with new lab space, management expertise and \$200,000 in venture capital. Then it made Hank Safferstein, one of its executives-in-residence, the chief executive of the preclinical company. The venture-capital fund-raising round — which added another \$1.2 million last year — should help Cognition Therapeutics to expand from three employees as it moves to clinical trials in the next few years. **P.S.**