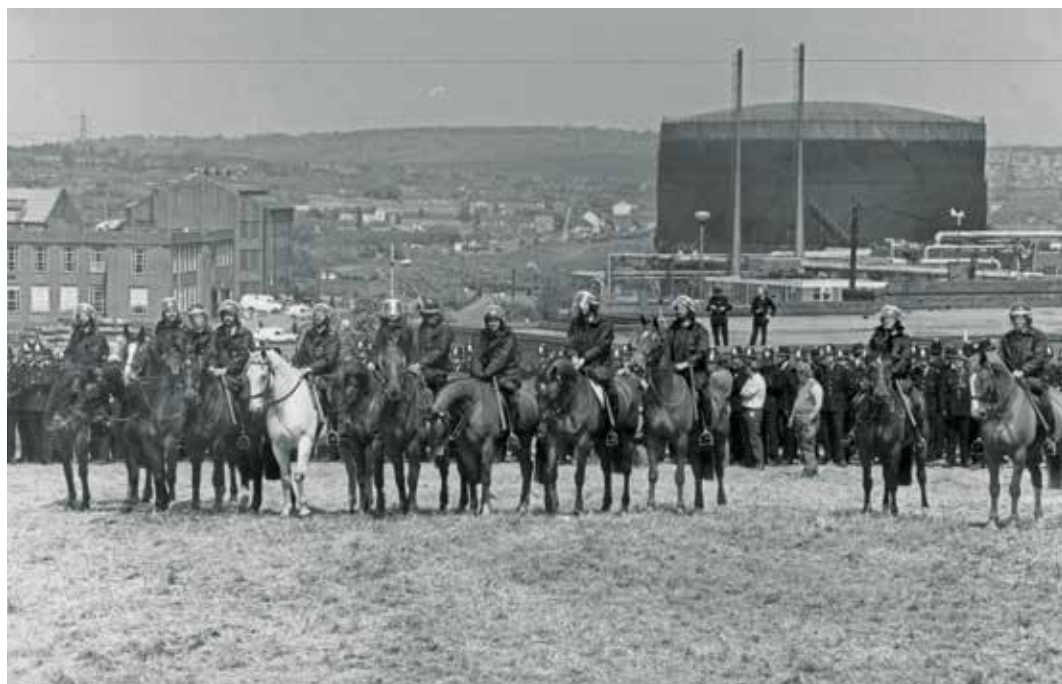




# Forging a new alloy

How should higher education institutions contribute to local and regional economic growth? **John Morgan** witnesses the groundbreaking efforts of Sheffield's two universities, drawing upon the city's manufacturing heritage to transform it into a hub of industrial innovation



The Sheffield Parkway dual carriageway speeds east out of the city into the neighbouring borough of Rotherham, where the signs for Orgreave appear. For many first-time visitors, the name will set off mental replays of TV pictures: police on horseback charging at shirtless striking miners on a summer day in 1984. The “Battle of Orgreave” was a surging confrontation between 10,000 picketers and 6,000 police officers, who smashed the attempted blockade of coal deliveries to a British Steel Corporation coking plant.

With the plant and the colliery long since closed, the site of British mass industrial employment’s loudest death rattle is now a peaceful new housing estate. Neighbouring that is the University of Sheffield’s Advanced Manufacturing Research Centre.

The AMRC aims to help the 100 or so manufacturers that constitute its membership to innovate, via research and development, on advanced machining, manufacturing and materials. The members include big global firms such as Boeing, Rolls-Royce and Siemens and smaller, locally based companies (some of them part of the big firms’ supply chains). And work ranges from engineering ultra-light-weight metal – or even woven carbon fibre – parts for aircraft and cars, to research on cooperative robots (“cobots”), with touch-sensitive skin, to see if they could work alongside humans in factories without doing them any injury. There is also an AMRC training centre, its huge shop floor filled with lathes and computer-operated 3D drilling machines, which the university uses to train apprentices for engineering careers in member firms.

The issue of whether, how and to what extent universities should be expected to contribute to local and regional economic growth is an issue across the world, and the AMRC’s hopeful vision has attracted a host of high-profile visitors, including George Osborne during his time as UK chancellor of the Exchequer, Scottish first minister Nicola Sturgeon and delegations from the Chinese and South Korean governments.

The civic ambitions of Sheffield’s two large



universities – the research-intensive University of Sheffield and the post-1992 Sheffield Hallam University – along with the scale of the economic problems created by South Yorkshire’s industrial decline mean that there is no better place in the UK to explore the possibilities and limitations of the academy’s regional impact. And that impact will become ever more important – and be placed under ever greater scrutiny – in light of the UK’s emerging devolution agenda, industrial strategy and, most of all, the enormous challenge of shaping a post-Brexit economy.

“Brexit is a major challenge to the mindset of research-intensive universities,” says Chris Husbands, vice-chancellor of Sheffield Hallam. The possible end of UK participation in European Union research funding programmes and damage to international recruitment threaten such institutions’ global outlook, he says. Moreover, the UK is “desperately going to need a regional strategy in a way that we probably haven’t had for 30 or 40 years”. So it is arguable, he says, that “we’re moving into a landscape that the Victorian founders of [such] universities would have recognised: that the university is a civic university, as well as being an international university”.

In the 1960s, there were 5,000 higher education students in Sheffield and 60,000 people working in the city’s steel industry. In 2017, there are only 4,500 steelworkers left – many of them employed by Sheffield Forgemasters,

**Industrial revolution** (clockwise from bottom left) the Battle of Orgreave was a notorious episode in Sheffield’s industrial history; Sheffield’s industry has declined from its heyday; Sheffield Forgemasters is the city’s largest remaining steel company



the city’s largest remaining steel company, whose hulking black sheds lie adjacent to the Rotherham-Sheffield railway line. But student numbers have risen to 60,000: one in 10 of the city’s entire population. A University of Sheffield-commissioned report by Oxford Economics in 2013 judged that, alone, the 8,200 international students among that body brought net benefits of £120 million a year to the city, and of up to £176 million to the wider region.

Richard Wright, executive director at Sheffield Chamber of Commerce, who has spent his career in local manufacturing, says that “after the industrial decline...we had a city here that very much felt a victim of its past”. But he sees the city’s universities as being “at the forefront of trying to change that culture”. And, crucially, “there was a period not that long ago when, if the universities had not been investing, there’d have been no investment happening in Sheffield”.

Wright believes it is significant that the two universities are prepared to work together, particularly under their current vice-chancellors. In February, for instance, the two universities, along with Sheffield Teaching Hospitals NHS Foundation Trust, published “A Better Future Together: A Prospectus for Sheffield City Region”, ahead of expected moves by Parliament to boost the powers of local decision makers (long delayed by a row over whether devolution in Yorkshire should be countywide, or focused on city regions).

The plan is for the three bodies to collaborate in six areas, ranging from “building an ambitious economy” – scaling up advanced manufacturing as well as emerging strengths in digital and medical engineering – to “transformation in education and skills” through an integrated approach from early years to further and higher education, including retaining more graduates in the region.

Sheffield Hallam’s history as a polytechnic under local authority control makes its civic mission particularly salient, in terms of preparing workers for the local labour market. Paul Blomfield, Labour MP for Sheffield Central, says that the University of Sheffield, a member of the prestigious Russell Group and based in the affluent Hallam constituency, uphill from the city centre, was “traditionally relatively remote [from the city]. But that’s changed over a number of years and it’s become progressively more interested in exploring how it can play a role in the city”.

Today, the University of Sheffield is keen to play up its own civic roots. The institution was founded with the help of a 1904 fundraising campaign that raised £50,000 (the equivalent of £15 million today) in donations from steel and factory workers, promising them that a university for Sheffield would be “for the people” and “help the local industries”, as well as “assist the nation in its trade competition with other nations”.

“[Sheffield’s] traditional manufacturing skill and the cutting-edge research capacity of our

two universities – bring those together and you’ve got a powerful combination,” says Blomfield.

That is the aim of the AMRC, which delivered major results for the Sheffield region earlier this year when member firms McLaren and Boeing announced that they would build new factories at the site – the latter being the American aircraft manufacturer’s first in Europe.

The centre, funded partly through the government’s “catapult” programme to promote university-industry collaboration on R&D, consists primarily of a “Factory of the Future”, which produces advanced parts for the aerospace, automotive and medical engineering industries, and a separate “Factory 2050”, which develops innovative manufacturing via digital technology and robotics.

The latter, consisting of a 60-metre diameter circle with glass external walls, is something of a Rotherham landmark – and deliberately so. The glass walls were chosen so that people could look in – particularly young people who might be inspired to set out on a path towards a career in engineering.

Hence, one key performance indicator for the facility, says Keith Ridgway, executive director and founder of the AMRC, is “snot on the windows” (on the outside, that is). “People think that manufacturing is a dead thing in Sheffield,” he adds. “People who have lost their jobs in steel [might ask]: ‘Why would we recommend that our kids go into it?’ Then



you can say: ‘This is a different thing to what you were involved in: look through the windows.’”

The sights they will see include researchers working alongside a slightly sinister seven-foot high “cobot” with squishy skin to help British engineering firm Meggitt speed up the process of assembling components for the aircraft industry. There are shelves lit with LEDs to guide workers to the right bucket and a smart workbench that provides a revolving, step-by-step on-screen visualisation of the part’s assembly. Fast, high-quality assembly means that UK firms can make it less appealing for buyers to go through the time-consuming process of shipping in cheaply produced parts from Asia, explains Chris Greaves, operations manager of the AMRC’s Integrated Manufacturing Group.

Sir Keith Burnett, Sheffield’s vice-chancellor, says that the AMRC’s development came about because of the university’s combination of research in technology, mechanical engineering and advanced materials – and, more specifically, because Ridgway had struck up a research link with a local manufacturer that went on to win a contract with Boeing, leading to the centre’s founding. An “ambitious city [and] local authority that believes in the possibility of [the centre]” was another key element, he adds.

“It isn’t always going to be the duty of a university to be more than a place of learning and understanding: that’s its fundamental duty,” says Burnett. “But it may have the opportunity to do things that are broader. And it may be able to help its academics to do that.”

Ridgway sees enrolling apprentices at the AMRC training centre as a key step. However, “not everybody saw this as a great idea. You can imagine other Russell Group universities

saying: ‘Why would you do that?’”

Nikki Jones, head of training, explains that the aim is to develop technical skills by “replicating the place of work”, as well as to nurture softer skills such as interview techniques. The training centre enrolls 200 new apprentices each year – 70 per cent from local SMEs – and matches them with the employers who will pay for their courses, she adds.

In the maintenance section of the training centre shop floor are a selection of chunky and complicated-looking gearbox motors for apprentices to take apart. This allows them to answer the questions “why is it broken” and “how can we stop it from happening again”, says one apprentice, Louise Brammer, from Sheffield crane firm Street CraneXpress. Brammer prefers the hands-on experience to the “theory” that was on offer at college, where she started a course. And it’s best to get some practical experience before you try fixing a gearbox motor on a crane up in the air, she points out.

Brammer describes herself as the “first engineer girl at my company”, and has found that there can “still be an old mindset” among some in the industry. But her course has given her the “confidence to deal with that”.

Ridgway says that “the majority of students here are from east Sheffield”, the more deprived half of the city, and that “a lot are from families who worked in the steel industry. This is real access – it’s not going to a private school for girls in the middle of Kent and showing them some cars.”

For all that, the education watchdog Ofsted raised criticisms in its first report on the centre earlier this year, saying that it required improvement on four out of five criteria. One of the criticisms was that “employers are

insufficiently involved in the coordination of apprentices’ learning in the workplace”. But Kerry Featherstone, director of the training centre, which opened in 2014, said that when the report was published Ofsted had “based much of its assessment on the centre’s early work and small first cohort”.

**D**espite the apprenticeship scheme, a political and social divide remains between Sheffield’s university communities and much of the rest of the city and region. This was exposed in last year’s EU referendum, when Sheffield was the only one of the North’s five largest cities to produce a majority for Leave. Charles Pattie, professor of electoral geography at the University of Sheffield, highlights estimates of constituency-level results in the referendum that suggest Sheffield Central, the location of Sheffield Hallam University and home to the bulk of students, produced a 30 per cent Leave vote while the poorer Penistone and Stocksbridge constituency had an estimated Leave vote of 61 per cent. That indicates a “really polarised city”, says Pattie. In the wider region, Husbands points to the “classic Brexit economies” in nearby Doncaster and Rotherham, which both voted Leave. “They are towns where, by and large, the retail hub has collapsed, and the manufacturing economy is weakened and the service economy that is provided is relatively low-wage,” he says. “And they have to break out – and we have to help them break out – of that sort of equilibrium.”

Sarah Champion, Labour MP for Rotherham, says that the AMRC is seen locally as “a little island on its own”. She thinks that the simple addition of “Rotherham” to its title would be a major step forward for the town’s image. The fact that the AMRC is “branded as Sheffield University” means that “even though it is in Rotherham...it’s talked about as ‘the AMRC in Sheffield’ or ‘on the

outskirts of Sheffield””, she says.

“I’ve spoken to the university about this. They say that they are trying to challenge it. [But] I’m not seeing outreach from [the AMRC] into the town itself; they don’t seem to be actively building those bridges.”

Champion does point out that “a number of young people in Rotherham” are getting apprenticeships at the AMRC training centre. But she sees a general unwillingness among the majority of Rotherham’s young people to take up apprenticeships. The town “needs to start upskilling its workforce, because otherwise the small-scale industry that’s left isn’t going to be able to recruit people”, she adds. “It is really ripe for what Sheffield University is looking at doing.” And she is optimistic about the impending opening of a university campus in Rotherham, which will offer degrees from the University of Hull and Sheffield Hallam.

The high costs of higher education are a factor for young people in the town, according to Champion, with many studying at Sheffield Hallam while continuing to live at home. “The fact that we have [Hallam] is really important for us, long term, economically,” she says.

If you come to Sheffield by train, Sheffield Hallam’s city campus is the first landmark that catches your eye once you get beyond the water and steel sculpture in the station plaza. Husbands says that 66 per cent of Hallam students come from within 40 miles of this and the institution’s other campus 20 minutes’ walk away, and its civic role is “locked into [Hallam’s] DNA”.

For instance, the university is helping to create a new Advanced Wellbeing Research Centre, along the lines of the AMRC but in Hallam’s strength areas of health and sports research. This will be the mainstay of Sheffield’s so-called Olympic Legacy Park located on the site of an old athletics stadium in Attercliffe, “one of the most deprived communities in the country”, according to Husbands. The

project is a joint venture between Hallam, Sheffield Teaching Hospitals NHS Foundation Trust and Sheffield City Council and aims to bring together researchers and industry to deliver “innovations that help people move”.

Sheffield Hallam’s macro- and micro-level programmes on education – a PhD student working on an education project with female ex-offenders being one example – is another important example of local engagement, Husbands adds. And he highlights Hallam’s role as lead in the Higher Education Progression Partnership for the Sheffield City Region, part of the National Collaborative Outreach Programme, in which the University of Sheffield and local colleges are also partners. The Wentworth and Dearne constituency, north of Rotherham, had a higher education participation rate of 15 per cent in 2007 and now has one of 29 per cent – which is “virtually up to the national average”, says Husbands. Hallam is “not going to claim sole responsibility”, he adds. “But it has been a consistent 10-year engagement, working with schools, working with communities.”

**I**n the highly centralised modern UK, the “provincial” cities that drove the country’s economy from the Victorian era until the 1960s frequently claim that they have been



neglected by central government, their infrastructure needs ignored and their economic capabilities underpowered. Meanwhile, funding mechanisms have pushed universities to chase national and international prestige, with the “golden triangle” of the most prestigious London universities and those of Cambridge and Oxford typically coming out on top. But regional devolution and the emergence of an industrial strategy in which the role of universities is explicitly acknowledged offer a chance for regional higher education institutions to take a lead in efforts to drive up local economic performance.

*Times Higher Education* has previously reported on how the University of Pennsylvania and Johns Hopkins University have redefined the idea of universities as “anchor institutions”, seeking to regenerate areas of their cities – Philadelphia and Baltimore respectively – pushed headlong into deprivation and despair by catastrophic deindustrialisation (“Pillar of the Community”, Features, 9 February). Beyond Oxford and Cambridge, no British university could match the scale of those institutions’ endowments, on which their power to act partly depends. But are there any lessons to be drawn from US academia’s attempts to combat post-industrial decline?

Burnett has visited Penn to look at its civic



**Innovate to regenerate** Sheffield Hallam University (above left) and the University of Sheffield (far right) are working together to bring in investment to the city: the Advanced Manufacturing Research Centre (below) is key to their strategy, and its high-tech facilities have been visited by Scotland’s first minister Nicola Sturgeon (bottom right), among others

