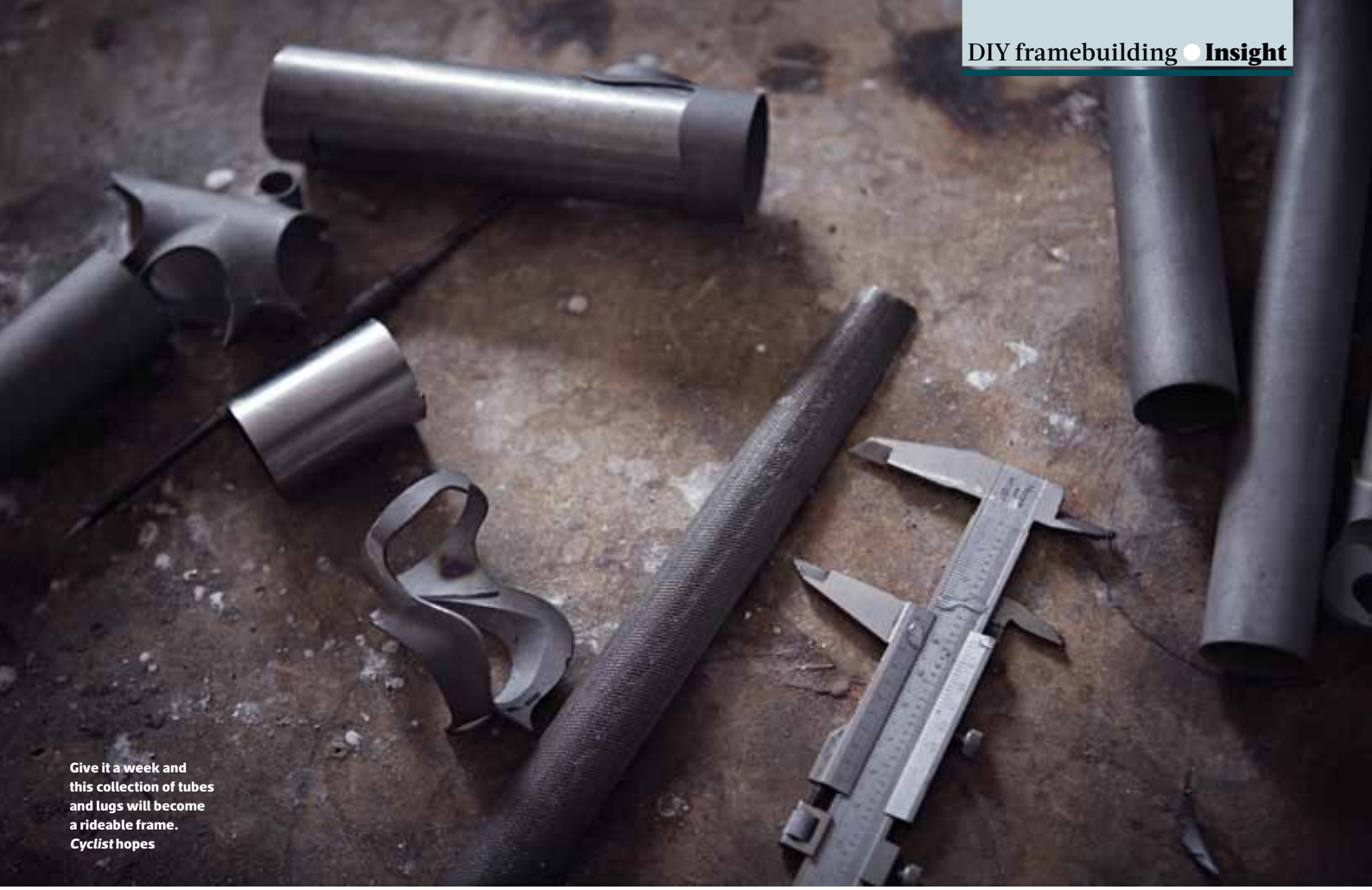
Brazed and confused

The only thing more personal than a bespoke frame is a bespoke frame you've built yourself. Cyclist *visits Bicycles by Design to see if the reality can live up to the framebuilding dream*

Words **JAMES SPENDER** Photography **FRED MACGREGOR**



Give it a week and this collection of tubes and lugs will become a rideable frame. *Cyclist* hopes

'By Friday afternoon, this is going to be your new bike,' says Pete Bird, emptying a biscuit tin full of lugs next to a pile of shiny tubes. I manage a nod and attempt to match his enthusiastic chuckles in a way that suggests I'm not revisiting painful memories of school metal-working classes. But Pete, who runs Bicycles by Design in Coalport, Shropshire, has been teaching people to build bicycles since he founded the UK's first framebuilding course in 1993, so having recognised my nervousness he's quick with the pep talk.

'Unless you're different from anyone else I've ever taught, you're going to find this challenging. You'll sweat, swear, and maybe even bleed, but at the end you'll be able to say, "I built that!", and when it's leant up outside the cafe and people are admiring it, you're going to be really proud. This bike will be an emotional part of you, and it'll be with you for life. Here are your safety glasses.'

My design for Life

As a beginner on a modest budget, my options for building my dream frame are limited. Stainless steel is out because it's expensive and difficult to manipulate, and so regular steel and lugged construction is in. During initial conversations with Pete's frambuilding partner, Rob Wade, I'd explained that I wanted to make something traditional with a modern twist, and that I'd always lusted after a Columbus SLX tubed bike. So after a flick through the catalogue of bikebuilding suppliers Ceeway, Rob suggests a Columbus Life tubeset and sloping top tube to give it that contemporary feel.

With a large 35mm diameter down tube and 31.7mm seat and top tube, lug choice is limited to the only set that fits – Llewelyn P3 lugs – and I'm going with a 'fast-back' seat tube design, where the seatstays meld seamlessly into the lug. This will lend the frame a slightly cleaner look at the rear end, as well as giving me the chance to see a different brazing technique at work. Hopefully, what will emerge at the other end is something that at least holds the wheels in.

Framebuilding courses are many and varied, from evening classes to the intensive, week-long, one-on-one tutelage that Bicycles by Design offers. What unites them, however, is the fact that you don't have to have any experience in the realm of framebuilding – or indeed have ever stepped foot in a workshop – in order to make a safe, bespoke and unique frame. With that in mind, Monday morning is designated discussion, measuring and coffee time.

Upstairs in the Bicycles by Design headquarters is a fit studio, which Rob and Pete use to size customers for bespoke frames, such as the one I will make, and those they build for customers under the award-winning name Swallow (see box on p120). Sitting on

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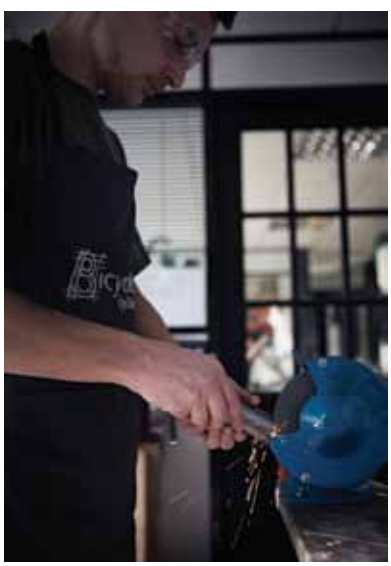
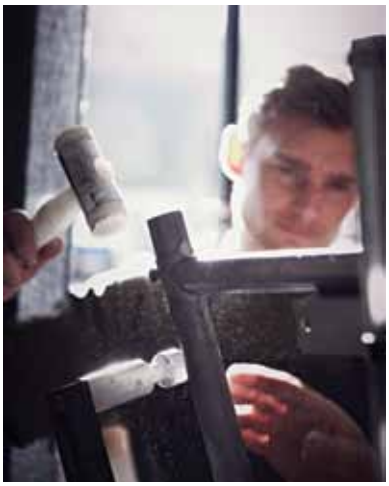




‘It’s like patting your head and rubbing your stomach, only standing on one leg and rotating your ankle at the same time’

the fit-jig – a static bike where geometry can be altered on the fly – I’m told to pedal while Pete fires a series of questions at me, winding wheels and twiddling knobs as he goes.

‘Do you pedal through the corners? Does your weight feel evenly distributed? What geometry do you normally ride?’

To the last question I confidently reply that I ride a 56cm frame with 73.5° seat tube and 155mm head tube, so I’m surprised to hear Pete recommend a 57.5cm frame with 74.5° seat and 200mm head tube.

‘Two hundred? Are you sure?’ I enquire, worried my chances of looking low-down-pro aggressive on this future bike have been dashed. ‘Yep,’ Pete replies. ‘That gives you a saddle drop of 36mm, which for me is normal for a sport bike, and provides enough height to play with in 20 years’ time when you’re older and less flexible. Anyway, take Cervélo – they’ve been making long head tubes for years, so you don’t end up with…’

Upon hearing the ‘C’ word I tell Pete I’m convinced, so with all the relevant measurements noted it’s off to the computer, where the *Bike CAD* software crunches the numbers and spews out blueprints. Tall head tube or not, the thing looks in proportion, and as soon as it has been declared UCI-legal by the software (which is lucky because I definitely see pros clamouring to race this frame) we head off to the workshop.

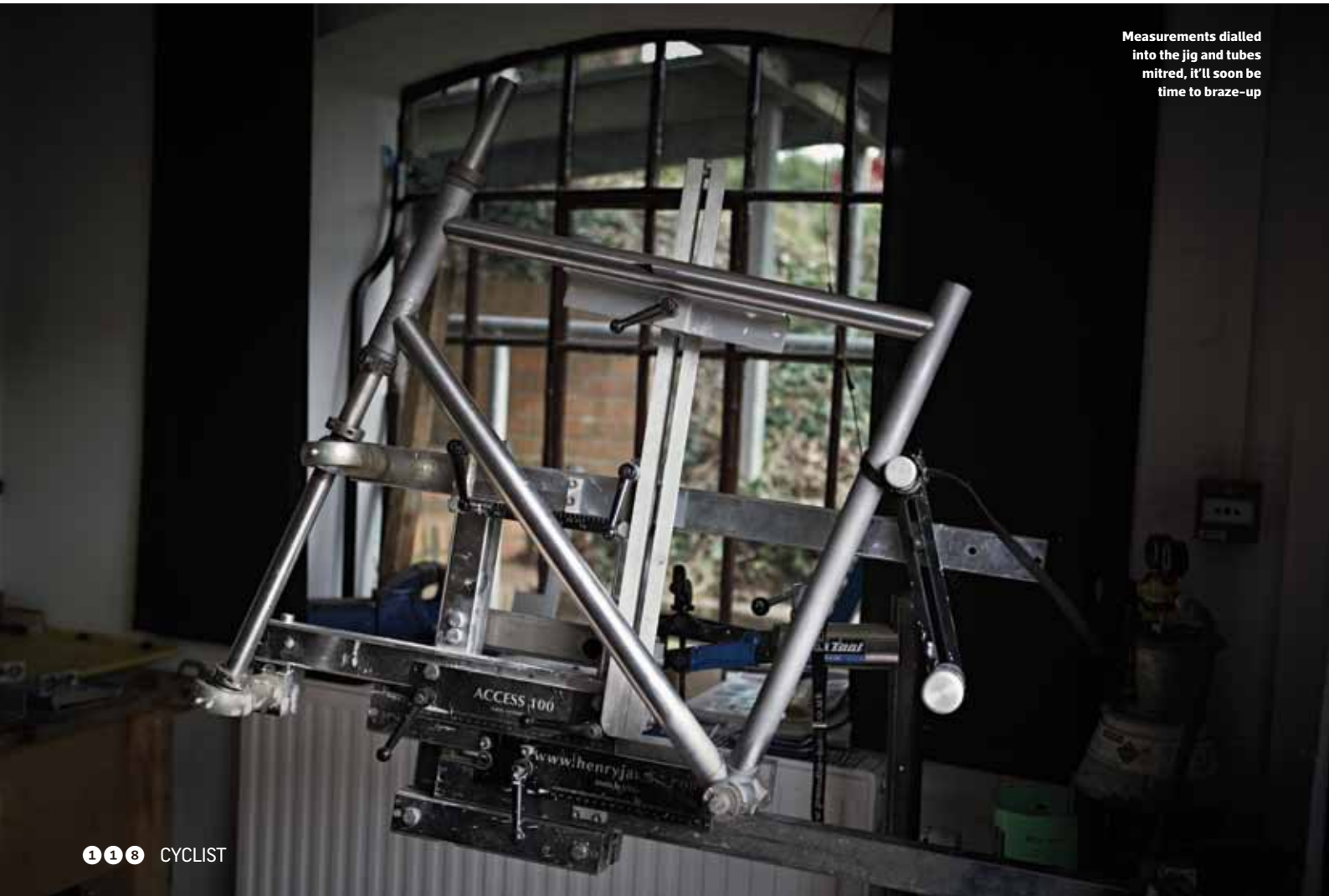
Crafting idylls

With the French doors flung open to the unseasonably warm Shropshire sun, a stack of frames in the corner and The Rolling Stones on the radio, the Bicycles by Design workshop is the epitome of that image so many of us harbour when we think how lovely it would be to retire to the country and live the life of an artisanal hermit. There’s even a workshop dog, Sprocket.

‘So, you’ve got your tubing, braze-on cable guides and bosses, dropouts and the lugs,’ says Pete. ‘These lugs are investment cast, which in simple terms means they look like a Crunchie under a microscope, with lots of porous holes.’

Pete explains we’ll be brass brazing the frame, a process where heated, liquefied filler is fed into the gap between the slotted-together tube and lug. The nature of the metals means the filler penetrates the microscopic holes to form a cohesive and solid joint.

‘When we’re brazing we’re heating up the metal in the joint then *feeding* in the brass then *flowing* it down into the joint,’ he says. ‘You need to understand that what we’re doing is pulling the melted brass into the joint using



Measurements dialled into the jig and tubes mitred, it’ll soon be time to braze-up

just the temperature of the brazing torch and capillary action [a process where liquids flow, or wick, through narrow gaps without the assistance of gravity].'

The key thing is heat. Too little and the brass will cease to flow; too much and you risk burning the tube which, unlike the chunky lugs, has a wall thickness of less than a millimetre. By way of demonstration, Pete grabs an off-cut of tubing, lights up the brazing torch and aims it at the tube.

'Watch the colour. It goes red. Orange. Yellow. White. Burn. Now there will be a tiny hole in that. And it's quick – that didn't take more than five seconds. So what we want to do is "simmer" the joint to build up the temperature where you want the brass. You're aiming for the metal to glow a dull cherry.'

It's a nerve-wracking lesson, but Pete seems unfazed by my expression and tosses the ruined metal to one side with a laugh before declaring that we'll go right ahead and braze the seat tube into the bottom bracket lug. I'm not entirely sure I'm ready to destroy £400 worth of metal just yet, so I'm pleased to learn I still need to mitre the seat tube, sandblast it and cover the joint with flux before I get my hands on the brazing torch.

Cleanliness is next to strongliness

Mitring, the process of shaping the end of each tube to butt neatly up against the next, sounds simple enough. Measure tube, mark with Sharpie pen, then file. But 15 minutes and a raw index finger later, I'm being regaled by Pete with the story of a student who had 'used the file like it was a fencing sword, *with just one hand*.' Realising I've been doing the same, I ask him to show me the proper technique, and within minutes a neat set of curves appears in the end of the tube. Lesson noted.

Seat tube mitred, Pete explains that essential to the strength of any brazed joint is how clean it is. Any surface contaminants can interrupt the flow of brass, and any oxidisation that occurs during heating will lead to carbon deposits that 'react badly with the brass and create a weak joint'. Sandblasting – firing a stream of fine sand against the tube and lug to reveal virgin metal – gets around the former, while daubing both parts with flux – a powdered chemical mixed into a paste with water – prevents the latter.

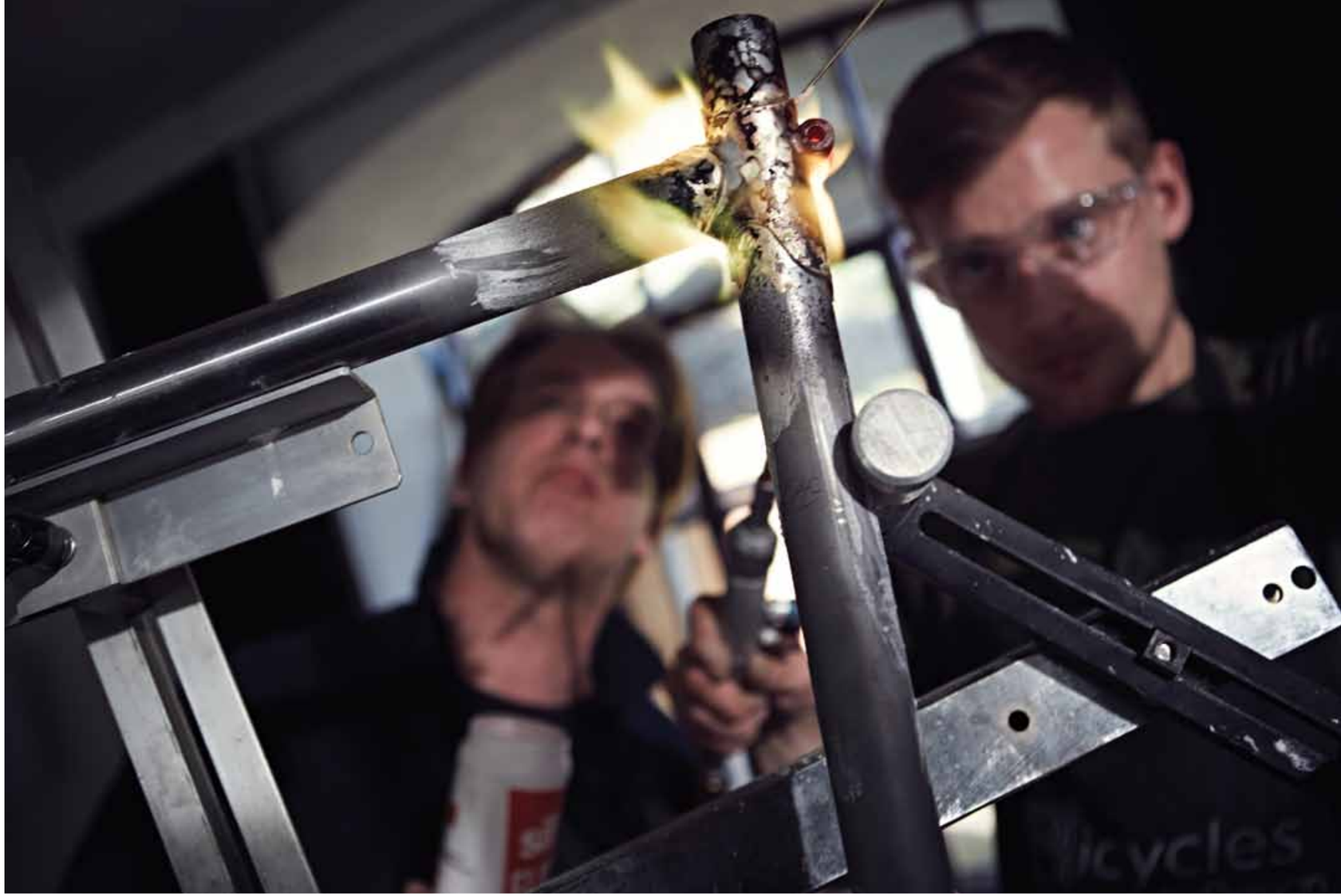
'Basically, flux is a cleaning agent and is there to assist with the flowing of the brass,' Pete says. 'Remember, you can't have too much flux! You'll notice as well that when you've reached a good temperature with the torch, the flux will go from orange peel to glassy in appearance. Right, shall we braze up?'

At first I'm tentative and rather uncoordinated. The cumbersome brazing torch in my right hand feels at odds with the fine rod of brass in my left, but after a bit of assistance from Pete, who guides my torch hand in small circles around the bottom of the lug to evenly distribute the heat, it feels like I'm getting it.

'It's a bit like patting your head and rubbing your stomach, only trying to stand on one leg and rotate your ankle at the same time,' he jokes over the sound of the rushing flame.

Torch off and I'm told I've done a half decent job, having flowed in a good amount of brass and created a decent radius – the thin curve of bronze that settles against the square edge of the lug. A quick trip back to the sandblaster to clean off flecks of errant brass and flux and I start thinking I might actually be good at this.

The next two days in the workshop are enjoyable and frustrating in equal measure. Fork dropouts are brazed to fork legs and steerer column to fork crown without too much fuss (although the latter takes a long time in the sandblaster before it loses the 'hewn in the fires of Mordor' look that becomes my trademark), and before long more tubes are positioned into the heavy metal 'Henry James' framebuilding jig.



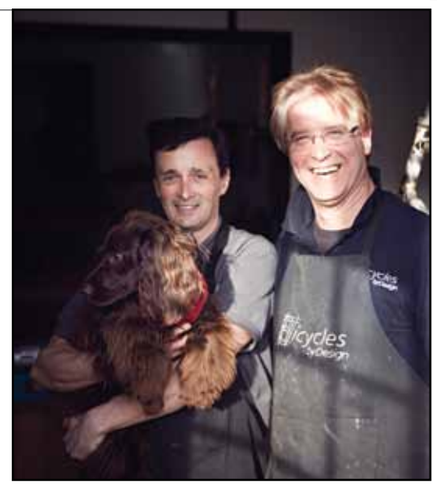
BUILD IT YOURSELF

Fancy a crack at your own frame? Well here's the rub...

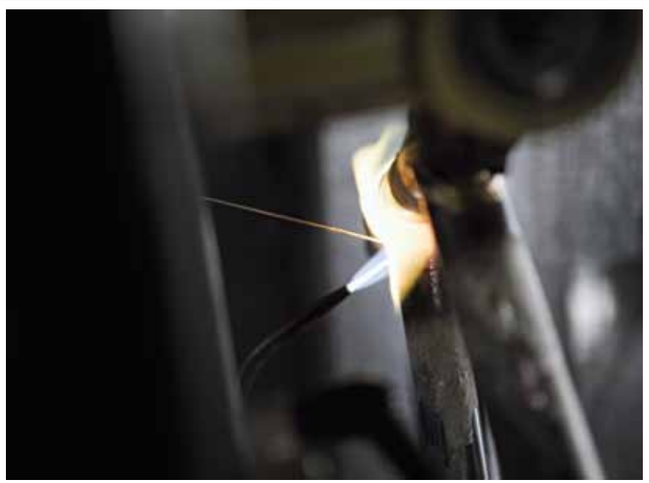
Pete Bird and Rob Wade have nearly 60 years' framebuilding experience between them, both as tutors and as professional builders under their joint-owned Swallow moniker. In 2013 their Swallow Reynolds 953 stainless steel bike won the Best Road Bike award at the prestigious Bespoked handmade bicycle show. Going to them seemed like an obvious choice.

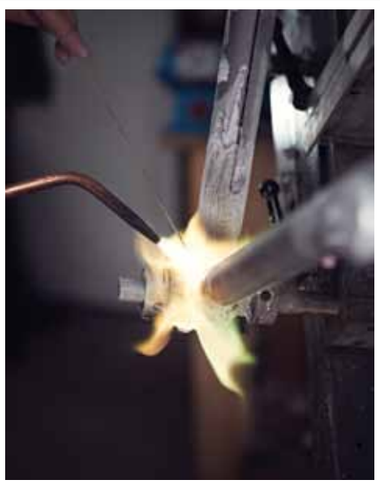
For most first-time builders stainless steel is out of the question, but each course at Bicycles by Design is tailored around the student's experience and abilities.

With that in mind, the course fee is a flat £975 for a week's one-to-one tuition, with material costs on top. Total cost for the *Cyclist* frame materials was a pint under £400, but Reynolds 525 tubesets start from around £105, with lugs from around £50. See bicycles-by-design.co.uk for details.

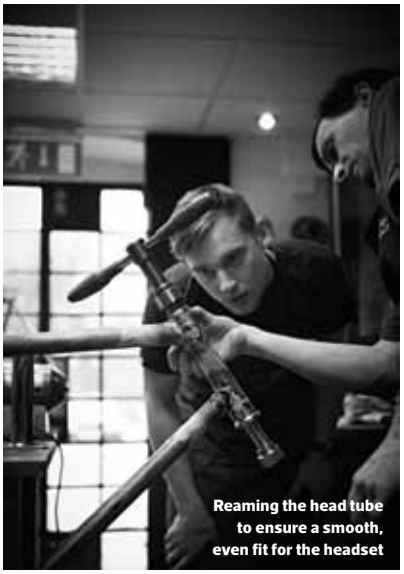


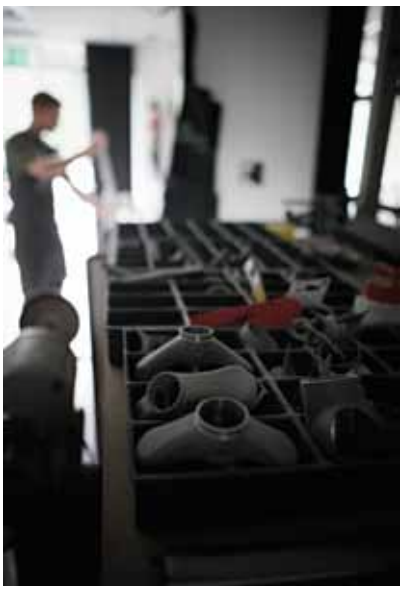
'The key thing is heat. Too little and the brass will cease to flow; too much and you risk burning the tube, which has a wall thickness of less than a millimetre'





Above: Pete Bird keeps a careful watch as *Cyclist* brazes up the main triangle. For a beginner this can be slow, anxious work, heating the lugs with the brazing torch in one hand while feeding the thin rod of brass filler into the joint with the other


Reaming the head tube to ensure a smooth, even fit for the headset



First it's just the seat tube and bottom bracket and head tube, but soon we add the down tube and top tube, all having been mitred to fit just so. By Wednesday afternoon the main triangle is clamped up in the jig with head lugs and seat lugs in place and ready to be brazed.

With three lugs to do in succession, the main triangle is an arduous process; me strafing round the jig to Pete's instruction, trying not to burn him as he spins the frame to proffer the next joint. More than once a hand shoots out to pull mine away from an area I'm about to overheat, or back towards a joint where the brass hasn't fully flowed, but after 45 minutes the workshop curtains are drawn and a perfect (in my eyes at least) front triangle glistens in the sun.

One in, one out

Thursday is the changing of the guard, with Rob taking over. He seems pleased at my progress, and over the next two days we start tackling the rear triangle. Things are going smoothly, dropouts brazed to chainstays and fork crown to fork legs, when we hit a snag. 'What does the drawing say, chainstays are 420mm?' asks Rob. 'I think you've taken a bit too much off here.' Sure enough pride has come before a 4mm fall, and I've filed one stay back to 416mm. Thankfully Rob says that unlike elsewhere in the frame, such as the top tube, this slip up isn't critical, so once the other chainstay is filed to match we're able to put both in position.

'Before we braze we tack the stays with a small amount of filler because it's easier to move the tack when it comes to adjusting the tracking [the frame's alignment] than it is once you braze the joint up,' says Rob. Sure enough, as soon as a dummy wheel is put between the dropouts it's apparent the rear end is 2mm out to the right. Not a lot you might think, but Rob isn't happy.

'For years I've wondered if I might one day become the Ernesto Colnago of the South of England. I'd say I've got the answer'

'Two millimetre tolerances might be good enough for mass-produced frames, but we can do better.' A little bit of push-pulling gets the chainstays in line, and then it's time for the final piece of the jigsaw: the seatstays.

Thus far everything has been lugged and brass brazed, but the fast-back nature of the seatstays, where there are no lugs, means their top ends have to be finely mitred then fillet brazed using silver filler. Rob explains that fillet brazing is a far harder technique, so for the first time this week all I can do is observe.

For years I've wondered if I might one day become the Ernesto Colnago of the South of England, but watching Rob now, waving his silver filler over the stays like an artist with a paintbrush, I've got the answer. The frame is all but finished, with just a few cable stops and bosses to go, but taking a step back I realise how much Pete and Rob's experience has contributed to it, and just how far off a framebuilder I am.

Yet despite their input – of which there was much – I'm still left with the resounding feeling that *I* made this frame, bespoke, unique and in my opinion, downright beautiful. And that is definitely a dream realised, and something to be proud of. Now where's that cafe? ❁

James Spender can teach any novice how to write the perfect article in around a week

THE FINISHING TOUCH

How to give your bike a unique appearance

'It's your paint that really makes your bike,' says Stuart Harris, founder of Ooey Custom Paint in Camberley, Surrey. And after a loosely written brief – 'Errr, I like orange?' – a rendering of the frame appears in my inbox. A couple of tweaks later and it's ready to be painted. The lead-time on frames at Ooey is typically around two weeks, dependent on current workload and design complexity. Wherever possible graphics are painted on, which requires the painstaking cutting and application of vinyl masking (however Ooey is happy to create traditional water decals, or work with anything the customer can provide). Before painting, the frames are shotblasted, primed and etched (an anti-corrosive treatment), which ensures an immaculate and long-lasting finish. Since this two-tone design was straightforward, it was done in less than a week at a cost of £360. Not cheap, but with many bikes now costing thousands, it's a small price to pay for a truly unique look.

Speak to Stuart direct on 01276 423088 or see ooeycustompaint.com