A Taste of the Other Side

When Richard Fussell still worked at the UK's Food and Environment Research Agency, he was the first customer to see the Thermo Scientific Q Exactive™ GC in action – well ahead of its official launch at ASMS 2015. The latest Orbitrap™ innovation made him wonder – not for the first time – if the grass was greener on the other side.

Take us back to your pre-Thermo Fisher Scientific days...

I worked in government laboratories for a very long time before moving to Thermo Fisher Scientific – latterly at the Food and Environment Research Agency in York, UK, working on a diverse range of projects, spanning many research areas, techniques and applications. Throughout those years, I very often found myself working in close collaboration with different manufacturers, helping to guide new and emerging technologies. As an analytical scientist, I always found it very exciting to be involved in such developments, contributing to advances and progress in the instrumentation we used on a daily basis.

My entry into the world of analytical chemistry, which actually began in the 1970s, was a little unconventional. I come from a working-class family of electricians, carpenters, plumbers, and so on. I was never great (or perhaps interested enough) at school and when I left, I went into the building trade. I remember one particularly nasty day in winter when my van broke down and I was late for my own birthday party. The very next day, I applied for – and got – a job in a laboratory. From there, I moved into a government laboratory – who paid for my education up to MSc level, and the rest is history.

So much has changed since those early days. I remember when I first started doing chromatography, we used a hacksaw and a file to cut and polish stainless steel tubing when building our own LC systems...

Why jump the fence?

Over the years, I received quite a few tempting offers from instrument companies – even as far back as the 1980s. I was always intrigued by the prospect, but never quite attracted enough to make such a leap of faith. But when the recent opportunity to join the team at Thermo Fisher Scientific ahead of the launch of an exciting new addition to the portfolio came along, the timing seemed right. Why Thermo Fisher Scientific, specifically? I honestly believed that Orbitrap technology was the best in the field, so it seemed like the winning team.

And that was confirmed when I visited Austin, Texas, to see the pre-launched Q Exactive GC. I was amazed; the performance of the instrument was almost unbelievable. Aside from the technology, one of the things that really impressed me was how open they were. We had such great discussions – and it really felt invigorating to be involved. Furthermore, it was a really nice atmosphere, and it seemed to me that I could learn a lot – not just in terms of the technology, but other skills as well. When you've worked in a particular environment for a long time, you have to be careful that you don't get stale. Looking back, maybe I should have challenged myself at an even earlier stage, but that's just the way it worked out...

How has GC-MS changed?

I remember when GC-MS was first introduced into our laboratory (when it had finally become affordable enough). We started with GC-single-quadrupole MS, which had certain limitations but

was the best we had at the time. And in the early 2000s, GC triple quadrupole MS systems came along, which added a lot of advantages, both in terms of the selectivity and the signal to noise we could obtain for pesticides residue analysis. We could suddenly analyze more pesticides in even more difficult matrices, just because of the extra selectivity.

But despite the advantages, I guess I wasn't alone in hoping for a full-scan acquisition technique that would allow us to capture as much information as possible. That is possible with single quadrupole instruments, but the problem is sensitivity – and the selectivity isn't great either.

It seems the Q Exactive GC was highly anticipated in your field?

Absolutely. GC Orbitrap technology takes us a big step forward by essentially combining the advantages of all techniques in one platform: much better sensitivity in full-scan acquisition mode, and better selectivity because we've got high resolution combined with high mass accuracy. Back in the days when we were using single quadrupole systems, I don't think anybody could have predicted we would get this far – that we would develop cutting-edge instrumentation to the point where it could become a routine technique.

Certainly, concurrent developments in computer science and electronics have been crucial... The first computer I used in a laboratory was a ZX Spectrum, so to get to where we are now, there really have been quantum leaps on many levels.

What makes Q Exactive GC so attractive for food analysis?

You have to remember that the whole area of residues, contaminants, and food safety has changed dramatically over the years – and there are a lot of other changes going on at the moment. For example, interest in authenticity and food integrity is burgeoning – looking at the bigger picture is becoming increasingly important. Orbitrap technology not only gives us the capability to look at residues and contaminants, but allows us to tap into other aspects. A good example is the whisky profiling and characterization work described by Jana Hajšlová last month (tas.txp.tp/1015/jana).

How quickly will it be adopted?

It won't happen immediately, of course. Introduction of new technology is an evolutionary process. The bigger research laboratories are often the first adopters; they often want to investigate the potential of the technology – and also push extra development. The smaller labs will follow. Years ago, we were one of the first labs to use an LC-MS/MS method, and I remember giving a presentation on the multi-residue analysis of about 30 pesticides. People couldn't believe it could be a robust, routine technique – now everyone's using LC-MS/MS. It's hard to believe that the same won't happen with GC-HRAM technology. You can take your sample; do the quantification, the identification – and the screening – all in one single analytical run.

As with any new technique, affordability will be perhaps the biggest barrier. But that too will change. As Alexander Makarov notes on page 48, Orbitrap technology is constantly evolving, which increases the knowledge base and reduces cost. For example, on the LC side we now have the Thermo Scientific Q Exactive Focus, which is an Orbitrap-based instrument intended for routine implementation at a more competitive price.

What about the future of food analysis?

New instrumentation empowers people to do and look at things differently. It's already the case that labs are trying to combine different analyte classes in analytical methods; for example, looking at pesticide residues and mycotoxins in the same analysis. Traditionally, these areas have been separated; I suppose the laboratories become compartmentalized – constrained by the instrumentation and methods available.

I see a future trend where, for certain samples, you'll be able to look for multiple analyte classes in the same method, or perhaps test for pesticide residues at the same time as collecting data for characterization or authentication. Similarly, there is a growing interest in looking for environmental contaminants – I've looked at the uptake of pharmaceuticals in plants caused by the use of treated sewage effluent on land, for example. It's surprising how many pathways exist for contaminants to get into food. And let's not forget food contact materials – John Gilbert goes into much more detail on page 28, but it is yet another separate world of contaminant analysis. The real driver for moving in this direction is the capability of the instrumentation available.

Another trend I see developing is using full-scan instruments to detect markers to help food manufacturers ensure product consistency from a quality control point of view. With global food trade, raw ingredients come from many different sources and are difficult to track. The use of chemicals varies over the world – as do the potential routes of contamination. I believe food manufacturers will increasingly want to screen their raw ingredients to ensure that the whole finished product is consistent over time. They certainly don't want any surprises that would undermine consumer confidence.

Do you feel like instrument manufactures are leading the charge?

Many of the potential trends I've indicated above would really not be possible without HRAM technology – so it does appear that in some aspects, analytical laboratories are very much dependent on the development of new instruments to be able to move forward in new directions. Certainly, not everybody recognizes that fact, but even if you consider something as simple as the QuEChERS method, would it really have become so successful without the introduction of LC-MS/MS?

And is the grass greener?

I've seen a lot of changes over my career – and many of the big ones came from instrument manufacturers. I think that's one of the reasons I recently decided to make a pretty big change for myself when I joined Thermo Fisher Scientific. Luckily, people from my old world still talk to me, even though I've crossed over to the "other side". And that's important – I made some great friends over the years on the conference circuit and beyond. Now, I've been on both sides of the fence – and I consider myself a mediator of sorts. In my current role, I can make sure we are communicating effectively with our customers and perhaps facilitate the kinds of collaborations I enjoyed in my previous life. I'm very happy to be where I am at this exciting time, and as for whether the grass is greener – well, that would be telling...

Video interview with Richard Fussell: tas.txp.to/1015/Fussell
To find out more: thermoscientific.com/QExactiveGC